PB-244 847

MISSOURI RIVER MAIN STEM RESERVOIR REGULATION STUDIES

Northern Great Plains Reources Program
Denver, Colorado

April 1974

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE

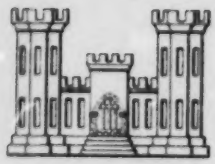
238106

PB 244 847

MISSOURI RIVER

MAIN STEM RESERVOIR REGULATION STUDIES

SERIES 1-74



CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
MISSOURI RIVER DIVISION
OMAHA, NEBRASKA
APRIL 1974

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
US Department of Commerce
Springfield, VA. 22151

PB244847

BIBLIOGRAPHIC DATA SHEET	1. Report No. NGPRP/CD-74/20	2.	3. Recipient's Accession No.
4. Title and Subtitle Northern Great Plains Resources Program Main Stem Reservoir Regulation Studies Series 1-74			5. Report Date April 1974 6.
7. Author(s) Water Work Group/Corps of Engineers, U.S. Army			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Northern Great Plains Resources Program Denver Federal Center Bldg. 67, Room 820B Denver, CO 80225			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address Department of Agriculture, Department of Interior, Environmental Protection Agency, States of Montana, Nebraska, North Dakota, South Dakota, Wyoming			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstracts

Analyses of potential impacts on six Missouri River Main Stem reservoirs of alternative levels of coal development in the Upper Missouri Basin. Categories analyzed are: 1) Flood control; 2) Potentials of meeting irrigation demands on Missouri Main Stem; 3) The adequacy of water to meet coal development needs; 4) Ability to meet water quality control needs; 5) Ability to meet downstream water supply needs; 6) Impact on navigation; 7) Impact on hydroelectric power generation; 8) Impact on fishery resources; and 9) Recreation and environmental impacts. It indicates that there is sufficient water to provide for coal development; the navigation season may have to be shortened and that there would be a reduction in hydroelectric power generation depending on the amounts of water used for coal development.

17. Key Words and Document Analysis. 17a. Descriptors

Northern Great Plains
Energy
Impacts
Hydropower
Reservoirs
Water supply
Coal
Development
Water
Missouri River
Navigation

17b. Identifiers/Open-Ended Terms

17c. COSATI Field Group

PRICES SUBJECT TO CHANGE

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
No restriction on distribution.	UNCLASSIFIED	63
	20. Security Class (This Page) UNCLASSIFIED	22. Price $7.25

Regulation Studies for Completed
Main Stem Reservoir System
1970, 1980, 2000 and 2020 Levels
Of Development and Streamflow Depletions

Series 1-74

A. INTRODUCTION

A-1. This series of fourteen separate but related studies has been made to explore the regulation of Fort Peck, Garrison, Oahe, Big Bend, Fort Randall, and Gavins Point reservoir projects, with the system of reservoirs initially filled followed by a recurrence of the hydrologic period from 1898-1972, inclusive, and with the basin development as programmed for the level under consideration. The model utilized in the studies extends through the main stem reservoir system and along the Missouri River downstream to Hermann, Missouri. Output includes pertinent data at each of the main stem reservoirs and at Sioux City, Omaha, Nebraska City, Kansas City, Boonville and Hermann. Time intervals utilized in the studies are generally of one-month duration, although during certain months the intervals may be broken down into periods of quarter-month duration.

A-2. In addition to updating available long-range regulation studies to reflect an extended record period, revised depletion estimates, modifications in physical characteristics, and the most recent regulation philosophy, a primary purpose of this series of studies was to explore the effects of contemplated coal development in Montana and North Dakota. The exact magnitude of development that will occur is unknown. Therefore, studies were made for four conditions of such development, as follows:

a. No coal development.

b. Minimum coal development which will ultimately result in an average annual depletion to runoff above the main stem system of 700,000 acre-feet.

c. Most likely coal development, ultimately resulting in an average annual depletion of 1,400,000 acre-feet.

d. Maximum coal development, ultimately resulting in an average annual depletion of 3,000,000 acre-feet.

A-3. As indicated by the title of this report, the studies examined various levels of water resource development in the Missouri River Basin. Development levels, and individual studies conducted at each level, are as follows:

a. 1970 Level. This is essentially the current level of basin water resource development. A single study, reflecting 1970 development and physical characteristics of the main stem system was made and titled 1-74-1970.

b. 1980 Level. Four studies were made to reflect conditions expected to occur by the year 1980, with each study assuming a different coal development program. These are:

1-74-1980, No coal development.
1-74-1980, D700, Minimum coal development.
1-74-1980, D1400, Most likely coal development.
1-74-1980, D3000, Maximum coal development.

c. 2000 Level. Four studies were made to reflect conditions expected to occur by the year 2000, with the various coal development schedules described above. These are titled 1-74-2000; 1-74-2000, D700; 1-74-2000, D1400; and 1-74-2000, D3000.

d. 2020 Level. Similar to the 1980 and 2000 levels, four studies were made to reflect conditions expected to occur by the year 2020 with the various levels of coal development. These are titled 1-74-2020; 1-72-2020, D700; 1-74-2020, D1400; and 1-74-2020, D3000.

e. Maximum ultimate depletions. The maximum depletions expected to ultimately occur including those resulting from maximum coal development were also examined. This study was titled 1-74-MAX-ULT and reflects the approximate magnitude of depletions that could be sustained above the main stem system during the 1930-1941 drought period while foregoing service to navigation but still providing a live river downstream with adequate flows for municipal water supply, cooling purposes, water quality control and recreational use.

A-4. Studies were aided through the use of the MRD Honeywell computer and the MRD-RCC main stem system regulation program, 724C0100. While some of the generalized regulation criteria utilized in the studies described in succeeding paragraphs, reference is made to the detailed computer printouts on file in the MRD Reservoir Control Center and to the 724C0100 program manual (unpublished) for the many details of the criteria necessary for the accomplishment of successful long range studies of this type.

A-5. The studies are based on the following conditions and objectives:

a. Historical streamflow, as obtained largely from USGS records, but utilizing C of E estimates during some periods for which records are unavailable.

b. Streamflow depletions for the appropriate level of basin development as developed by the Work Group on Hydrologic Analysis and Projections of the MBIAC in connection with the Missouri River Comprehensive Framework Study, and as updated by the office of Upper Missouri Region, Bureau of Reclamation in late 1973.

c. The loss of main stem reservoir storage by sedimentation appropriate to the examined development level.

d. Maintenance of downstream flows required for water supply, water quality control as established by FWPCA, and, in the case of the study of maximum depletions, flows believed necessary for power plant cooling and other purposes as discussed in paragraph A-3e.

e. Maintenance of the highest navigation streamflow rates at downstream control points as practicable with the water supply available after satisfying the various depleting uses and providing equitable service to power.

f. Maintenance of release rates from each reservoir for maximum power generation consistent with the other stated purposes.

g. Maintenance of adequate storage space reserves in each reservoir to permit controlling of inflows to minimize damages during downstream flood situations.

B. BASIC DATA

B-1. Missouri River Reaches. In order to conduct the studies and evaluate the effects of reservoir regulation, the Missouri River was divided into specific reaches, defined by the main stem reservoirs and navigation control points below the reservoir system. The reach boundaries are the following locations: Fort Peck Dam, Garrison Dam, Oahe Dam, Fort Randall Dam, Gavins Point Dam Sioux City, Omaha, Nebraska City, Kansas City, Boonville, and Hermann.

B-2. Streamflow. Historical monthly inflows to each of the Missouri River reaches defined above were obtained by analysis of USGS records and estimates (Water Adequacy Reports and USGS Circular 10[illegible] dated March 1951). These were supplemented by analysis of Corps of Engineers' records at locations where USGS data were not available. These estimates were developed to be consistent with the USGS data available for upstream and downstream stations.

B-3. Reach Inflow Adjustments. The historical reach inflows represent flows during a changing level of water resource development. During the early years of the 1898-1972 record period, water resource developments were few and depletions to the natural water supply were nominal or non-existent. However, in the later years of the record period, water resource developments and resulting streamflow depletions increased materially. In order to provide a consistent series of monthly flow records equivalent to the examined levels of development, it was necessary to adjust the historical flows to represent flows which would have occurred had the examined level of development been in existence throughout the 1898-1972 period.

B-4. Streamflow Depletions. The Task Force on Streamflow Depletions of the Missouri River Basin Comprehensive Framework Study made a detailed examination of water resource development that has taken place in the basin and developed estimates of the effects of this development upon historical streamflow. The 1970 development level was selected as a base to reflect these effects through the historical period and for extending the effects to future levels of water resource development. The extension of depletions to post-1970 basin development levels was based on estimates in the growth of depleting activities throughout all portions of the basin. Items considered in the estimates included irrigation, domestic use, industrial and mineral water use, thermal power, evaporation from reservoirs and ponds, livestock use, watershed treatment, wetlands and fish and wildlife areas, imports and exports and weather modification. Further discussion of month-by-month depletion estimates for current and future levels of basin development, consistent with the historical water supply, is given in the MRD-RCC report on the 6-69 series of regulation studies, dated March, 1970.

B-5. The depletion estimates referred to in the preceding paragraph were made in the mid-1960's. After reviewing these estimates in some detail in connection with their current Northern Great Plains Resource Program, the USBR concluded that the 1970-level estimates presented in the Framework study were satisfactory for continued use. However, revised estimates for expected post-1970 depletions were developed by that agency and have been incorporated in the current series of long range regulation studies. Essentially these revisions consisted of a significant slowdown in the rate of depletion growth for all areas above Sioux City. The Framework depletion estimates for the Basin below Sioux City were not reviewed, therefore these estimates were held the same. The most likely growth in average annual depletions, including those required for coal development, is estimated to be as follows:

Most Likely Growth in Average Annual Depletions, 1,000 AF

	1910-1970	1970-1980	1970-2000	1970-2020	1970-Ultimate
Above Fort Peck	682	134	266	442	488
Fort Peck to Garrison	857	754	2,472	3,053	4,737
Garrison to Oahe	319	160	774	967	1,324
Oahe to Fort Randall	124	15	42	77	65
Fort Randall to Gavins Point	122	24	48	79	79
Gavins Point to Sioux City	115	104	67	198	35
Sioux City to Omaha	82	215	565	1,040	1,040
Omaha to Nebraska City	965	776	1,086	1,590	1,590
Nebraska City to Kansas City	1,005	546	1,485	2,506	2,506
Kansas City to Boonville	129	257	589	863	863
Boonville to Hermann	129	204	459	725	725
Total	4,529	3,189	7,853	11,540	13,452

The above estimates include annual coal development depletions amounting to 200,000 acre-feet by 1980, 1,080,000 acre-feet by 2000, 1,400,000 acre-feet by the year 2020; they also assume that depletions below Sioux City will not increase after 2020.

B-6. Estimated depletion growth beyond 1970 with minimum coal development was similar to the above except that the coal development rate was assumed to be one-half the rate given above or 700,000 acre-feet by the year 2020. Depletion growth with maximum likely development included additional irrigation and coal development depletions over the most likely. These additions amounted to 202,000 acre-feet above Sioux City by 1980, 1,325,000 acre-feet by 2000, and 2,215,000 acre-feet by the year 2020. Of the additional depletion growth by the year 2020, 1,100,000 acre-feet was assumed to result from maximum coal development for a total of 2,500,000 acre-feet depleted for that purpose. The growth in depletions for studies with no coal development were the same as the most likely except that the coal development depletions were assumed not to occur.

B-7. The study of maximum ultimate depletions assumed that coal developments would require 3,000,000 acre-feet of water annually. Additionally, irrigation and other uses would result in over 2 million acre-feet more annual depletions than would the most likely ultimate depletions. It was assumed for study purposes that depletions below Sioux City would remain at the 2020 level. Depletions above Sioux City, as furnished by the U.S.B.R., are as follows:

Maximum Ultimate Depletions, 1,000 AF (1970-Ultimate)

Reach	Non-Coal Developments	Coal Developments	Total
Above Fort Peck	1,036	700	1,736
Fort Peck to Garrison	3,952	2,300	6,252
Garrison to Oahe	1,446	-	1,446
Oahe to Fort Randall	162	-	162
Fort Randall to Gavins Point	183	-	183
Gavins Point to Sioux City	34	-	34
Total above Sioux City	6,813	3,000	9,813

B-8. As discussed in paragraphs B-3 and B-4, reach inflow adjustments reflecting depletions at the 1970 basin development level for all reaches and to the 1980, 2000 and 2020 levels for reaches below Sioux City were made on the basis of historical water availability (as well as other assumptions) for each month of the historic 1898-1972 record period. In view of the minor overall effects resulting from this refinement in the reaches above Sioux City and in the interest of facilitating accomplishment of the studies, normal monthly depletions for each reach reflecting development beyond 1970 were used directly to modify the developed 1970 monthly reach inflows. For all studies other than 1-74-MAX-ULT, the monthly distribution of depletions beyond the 1970 level was as furnished by the

U.S.B.R. The monthly distributions in 1-74-MAX-ULT were based on the maximum likely 2020 depletions. Monthly depletions beyond the 1970 level utilized in the studies are given on pages 7 and 8.

B-9. Evaporation Rates. Normal monthly evaporation rates for the main stem reservoirs were obtained from the working paper on Evaporation by the Work Group on Hydrologic Analyses and Projections of the Comprehensive Basin Planning Studies. The selected annual net evaporation (lake evaporation plus runoff minus precipitation) depths for normal climatic periods are as follow:

Fort Peck	27.5 inches
Garrison	20.0 inches
Oahe	20.0 inches
Big Bend	19.5 inches
Fort Randall	19.0 inches
Gavins Point	18.0 inches

B-10. During the 1930-1941 drought period, annual gross evaporation was computed for each year by the following procedures. The period 1942-1962 was considered a normal period, and, by utilizing the normal annual evaporation depths with temperature, humidity and wind data at or near each of the reservoirs during the 1942-1962 period, an appropriate constant was derived for each project to solve the empirical equation:

Evaporation = K (wind) (water surface vapor pressure - vapor pressure of air)

It was assumed that the water surface temperature would, over the course of a year, equal the observed air temperature. The constant derived above, in combination with observed wind, humidity and temperature data, was then used for computing the annual evaporation from each project for each of the drought years. Actual precipitation at each of the projects was utilized for determination of the annual net evaporation.

B-11. From an analysis of available surface temperature and precipitation records of the main stem reservoirs, the seasonal distribution of the annual net evaporation was assumed to be as follows:

January	0 percent
February	0 percent
March	0 percent
April	0 percent
May	7 percent
June	5 percent
July	19 percent
August	20 percent
September	19 percent
October	13 percent
November	12 percent
December	5 percent

Monthly Depletions
Thousands of Acre-feet

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Above Ft. Peck													
1970-1980*	-2	-1	-2	0	18	35	53	29	12	-3	-3	-3	134
1970-2000, normal**	-3	-3	-3	2	39	72	104	54	22	-6	-6	-5	266
maximum	13	15	13	19	89	142	220	142	69	7	8	10	746
1970-2020, normal**	-6	-5	-6	0	61	119	183	96	36	-15	-12	-10	442
maximum	29	32	28	37	157	258	405	260	131	18	19	22	1395
1970- Max ultimate	60	60	60	60	180	280	430	280	150	60	60	60	1740
Ft. Peck to Garrison													
1970-1980, no coal	-5	-3	-5	27	75	98	128	112	74	44	17	-6	554
Minimum	4	5	4	35	83	106	136	120	82	52	25	2	654
most likely	12	14	12	43	91	115	144	128	91	60	34	10	754
maximum	17	18	16	50	106	147	197	169	109	65	38	15	948
1970-2000, no coal	-10	-7	-10	85	189	229	292	254	186	128	70	-14	1592
minimum	35	38	35	130	234	274	337	299	230	173	115	32	1932
most likely	80	83	80	175	279	319	382	344	276	218	160	76	2472
maximum	112	116	112	210	338	407	524	455	334	246	189	107	3150
1970-2020, no coal	-13	-9	-13	96	232	292	370	302	211	133	70	-17	1653
minimum	45	50	45	154	290	350	428	360	269	192	128	41	2353
most likely	104	108	104	212	349	409	486	419	328	250	186	99	3053
maximum	142	148	143	258	444	547	718	599	429	285	218	134	4063
1970- Max ultimate	190	190	190	360	700	890	1200	980	670	410	280	190	6250
Garrison to Oahe													
1970-1980, normal**	-1	-1	-1	3	24	36	50	37	16	0	-2	-1	159
maximum	-1	-1	-1	2	24	36	50	38	18	2	0	0	167
1970-2000, normal**	-2	-2	-2	59	134	153	205	73	121	39	-5	-2	774
maximum	-3	-2	-2	59	136	156	213	84	128	46	1	1	817
1970-2020, normal**	-2	-2	-2	66	165	198	264	109	142	41	-7	-2	967
maximum	-4	-4	-3	65	172	211	300	150	159	47	-3	-1	1089
1970- Max ultimate	0	0	0	90	230	270	390	200	210	60	0	0	1450

*Depletions used in all studies of indicated development level.
**Normal depletions used in studies with no coal, minimum, and most likely

Monthly Depletions (cont'd)
Thousands of Acre-feet

Oahe to Ft. Randall	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1970-1980*	0	0	0	1	3	4	5	2	1	0	0	0	15
1970-2000, normal**	-1	-1	-1	2	9	14	14	5	2	0	-1	-1	42
maximum	-1	-1	-1	2	10	15	16	7	3	0	-1	-1	48
1970-2020, normal	-1	-1	-1	3	16	25	25	9	4	0	-1	-1	77
maximum	-1	-1	-1	3	17	27	29	13	6	0	-2	-2	89
1970-Max-ultimate	0	0	0	10	30	40	50	20	10	0	0	0	160
Ft. Randall to Gavins Point													
1970-1980*	0	0	0	1	4	7	7	4	2	0	0	0	25
1970-2000, normal**	0	0	0	2	9	14	14	6	3	0	0	0	48
maximum	-3	-3	-1	1	26	49	46	39	20	4	-6	-5	166
1970-2020, normal**	0	0	0	3	15	24	23	10	5	0	-1	-1	79
maximum	-3	-3	-1	2	32	58	55	44	22	4	-7	-6	197
1970-Max-ultimate	0	0	0	0	20	50	50	40	20	0	0	0	180
Gavins Point to Sioux City													
1970-1980*	0	0	0	5	20	30	30	11	6	1	0	0	104
1970-2000*	-11	-9	-5	6	29	45	41	9	-2	-12	-12	-12	66
1970-2020*	-11	-9	-6	13	56	85	81	23	4	-12	-13	-13	199
1970-Max-ultimate	0	0	0	0	10	10	10	0	0	0	0	0	30

* Depletions used in all studies at indicated development level.
** Normal depletions used in studies with no coal, minimu, and most likely coal development.

B-12. Reservoir Sedimentation. Re-surveys of the reservoir topography are made periodically to determine the loss of storage space resulting from the inflow and deposition of sediment on the reservoir floor. Undoubtedly some difference in storage space from current usage would be evident if surveys were made in 1970. However, the tables now in use (January 1974) were considered applicable for the 1970-level study. At future development levels (1980, 2000 and 2020) consideration was given to the date of the reservoir survey upon which current capacity tables were based and to the estimated average sediment inflow to each of the reservoirs. The assumption was made that the portion of total sedimentation which occurred by a specific date would be distributed in any particular elevation zone of the reservoir in the same ratio as the current storage in the particular elevation zone is related to the current total storage at the normal maximum pool elevation. Sediment volumes assumed to be deposited in each reservoir, in excess of the current sedimentation, are indicated by the following table:

Project	Annual Sediment Inflow, Acre-Feet	Total Sediment Inflow, 1,000 AF		
		1980	2000	2020
Fort Peck	17,500	140	490	840
Garrison	38,100	419	1181	1943
Oahe	32,300	388	1034	1680
Big Bend	4,400	40	128	216
Fort Randall	16,600	216	548	880
Gavins Point	2,500	25	75	125

B-13. Storage Allocations. Allocation of storage to various functions in the main stem projects is based on the allocations approved by the Chief of Engineers in July 1960, as adjusted to recognize subsequent sediment accumulations. The storage allocations used in these studies are as follow:

1970 STORAGE ALLOCATIONS
(1,000 Acre-Feet)

Project	Exclusive Flood Control	Annual Flood Control and Multiple Use	Carryover Multiple Use	Inactive	Total
Fort Peck	1,000	2,700	10,900	4,300	18,900
Garrison	1,500	4,300	13,400	5,000	24,200
Oahe	1,100	3,200	13,700	5,500	23,500
Big Bend	175	--	270	1,465	1,910
Fort Randall	1,000	1,300	2,200	1,200	5,700
Gavins Point	60	100	195	165	520
Total	4,835	11,600	40,665	17,630	74,730

1980 STORAGE ALLOCATIONS
(1,000 Acre-Feet)

Project	Exclusive Flood Control	Annual Flood Control and Multiple Use	Carryover Multiple Use	Inactive	Total
Fort Peck	1,000	2,600	10,900	4,200	18,700
Garrison	1,500	4,200	13,100	4,900	23,700
Oahe	1,100	3,100	13,500	5,400	23,100
Big Bend	175	--	265	1,430	1,870
Fort Randall	900	1,300	2,100	1,200	5,500
Gavins Point	60	95	185	155	495
Total	4,735	11,295	40,050	17,285	73,365

2000 STORAGE ALLOCATIONS
(1,000 Acre-Feet)

Project	Exclusive Flood Control	Annual Flood Control and Multiple Use	Carryover Multiple Use	Inactive	Total
Fort Peck	900	2,600	10,700	4,200	18,400
Garrison	1,400	4,100	12,700	4,700	22,900
Oahe	1,000	3,000	13,100	5,300	22,400
Big Bend	165	--	250	1,360	1,775
Fort Randall	900	1,200	1,900	1,100	5,100
Gavins Point	50	80	165	140	435
Total	4,415	10,980	38,815	16,800	71,010

2020 STORAGE ALLOCATIONS
(1,000 Acre-Feet)

Project	Exclusive Flood Control	Annual Flood Control and Multiple Use	Carryover Multiple Use	Inactive	Total
Fort Peck	900	2,600	10,400	4,100	18,000
Garrison	1,400	3,900	12,300	4,500	22,100
Oahe	1,000	2,900	12,700	5,100	21,700
Big Bend	155	--	240	1,285	1,680
Fort Randall	800	1,100	1,800	1,000	4,700
Gavins Point	45	70	145	120	380
Total	4,300	10,570	37,585	16,105	68,560

The corresponding reservoir elevations and storage capacities are shown on pages 11 and 12. The 2020 storage allocations were also assumed applicable for study 1-74-MAX-ULT.

1970 STORAGE ALLOCATIONS

	Maximum Pool		At Base of Exclusive Flood Control		At Base of Annual F.C. and Multiple-Use		At Top of Inactive Storage	
	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000 AF
Fort Peck	2250	18,909	2246	17,932	2234	15,228	2160	4,283
Garrison	1854	24,137	1850	22,635	1837.5	18,348	1775	4,976
Oahe	1620	23,507	1617	22,416	1607.5	19,239	1540	5,521
Big Bend	1423	1,915	1420	1,737	--	1,737	1415	1,466
Fort Randall	1375	5,750	1365	4,767	1350	3,447	1310	1,243
Gavins Point	1210	522	1208	460	1204.5	362	1195	165
Total		74,740		69,947		58,361		17,654

1980 STORAGE ALLOCATIONS

	Maximum Pool		At Base of Exclusive Flood Control		At Base of Annual F.C. and Multiple-Use		At Top of Inactive Storage	
	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000AF	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000 AF
Fort Peck	2250	18,758	2246	17,789	2234	15,166	2160	4,249
Garrison	1854	23,678	1850	22,205	1837.5	17,999	1775	4,881
Oahe	1620	23,107	1617	22,035	1607.5	18,912	1540	5,427
Big Bend	1423	1,871	1420	1,697	--	1,697	1415	1,432
Fort Randall	1375	5,491	1365	4,552	1350	3,292	1310	1,187
Gavins Point	1210	494	1208	435	1204.5	342	1195	156
Total		73,399		68,713		57,408		17,332

2000 STORAGE ALLOCATIONS

	Maximum Pool		At Base of Exclusive Flood Control		At Base of Annual F.C. and Multiple-Use		At Top of Inactive Storage	
	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000 AF
Fort Peck	2250	18,398	2246	17,448	2234	14,817	2160	4,167
Garrison	1854	22,882	1850	21,458	1837.5	17,394	1775	4,717
Oahe	1620	22,426	1617	21,385	1607.5	18,354	1540	5,267
Big Bend	1423	1,773	1420	1,608	--	1,608	1415	1,358
Fort Randall	1375	5,089	1365	4,219	1350.	3,051	1310	1,100
Gavins Point	1210	437	1208	385	1204.5	303	1195	138
Total		70,005		66,503		55,527		16,747

2020 STORAGE ALLOCATIONS

	Maximum Pool		At Base of Exclusive Flood Control		At Base of Annual F.C. and Multiple-Use		At Top of Inactive Storage	
	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000 AF	Elev Ft/msl	Storage 1000 AF
Fort Peck	2250	18,020	2246	17,089	2234	14,512	2160	4,082
Garrison	1854	22,061	1850	20,688	1837.5	16,770	1775	4,548
Oahe	1620	21,744	1617	20,735	1607.5	17,796	1540	5,107
Big Bend	1423	1,678	1420	1,522	--	1,522	1415	1,284
Fort Randall	1375	4,686	1365	3,885	1350	2,809	1310	1,013
Gavins Point	1210	380	1208	335	1204.5	264	1195	120
Total		68,659		64,254		53,673		16,154

B-14. Replacement Storage. Storage space has been provided in certain USBR tributary reservoirs which will be regulated to replace annual flood control and multiple-use space in the main stem system. With the space available, it is possible to regulate individual main stem reservoirs with a higher multiple-use storage level when an adequate water supply is available with no adverse effects on the system's flood control function. It was assumed in these studies that 1,200,000 acre-feet of replacement storage space was available in the year 1970. The availability of this replacement storage space effectively increases the system storage at the base of the annual flood control and multiple-use zone by a corresponding amount or, under the 1970 conditions, from 58,361,000 acre-feet to 59,561,000 acre-feet. It was further assumed that the 1980-level would also have 1,200,000 acre-feet of replacement storage space available while the 2000 and 2020 levels of basin development would have 2,200,000 and 2,600,000 acre-feet respectively. The latter values are based on expected tributary flood control storage development after the year 1980.

B-15. Tailwater. The tailwater levels used in compiling the power characteristics for all main stem projects were based on conditions occurring in 1974 at the time of the study. It was assumed that at the 1970-level the tailwater conditions were identical to those now occurring. For 1980-level studies it was assumed that the Garrison tailwater would be 1 foot lower than current while the Fort Randall tailwater would be 5 feet lower and Gavins Point 1 foot lower than at present. By the year 2000 it was assumed that tailwater at Garrison would be 8 feet lower, Fort Randall 10 feet lower and Gavins Point 11 feet lower than at the present time. No further reduction in tailwater elevations was assumed beyond the year 2000. Fort Peck, Oahe and Big Bend tailwater elevations were assumed to remain unchanged from their current levels for all of the studies.

B-16. Power. The nameplate ratings of power installations at each plant as used in this study were as follow:

Fort Peck	165,000 kw
Garrison	400,000 kw
Oahe	595,000 kw
Big Bend	468,000 kw
Ft. Randall	320,000 kw
Gavins Point	100,000 kw
Total	2,048,000 kw

B-17. Power Plant Performance. The maximum peaking capabilities of the power plants were limited to the greater of either (a) the maximum which has been actually experienced, or (b) 107.5 percent of the nameplate capacity, with the exception of Big Bend and Gavins Point. At Big Bend and Gavins Point a maximum capability of 115 percent of nameplate was assumed. However, until such time that further degradation of the Gavins

Point tailwater occurs, maximum capability from that project is limited to less than 115 percent of nameplate. Actual maximums assumed at each plant were as follows:

	Capability in Megawatts			
	1970	1980	2000	2020
Fort Peck	200	200	200	200
Garrison	460	460	460	460
Oahe	685	685	685	685
Big Bend	538	538	538	538
Fort Randall	368	368	368	368
Gavins Point	99	103	115	115
Total	2,350	2,354	2,366	2,366

In order to prevent objectional surges downstream, peaking releases from Gavins Point were limited to not over 40 percent departure from the mean rate maintained during the period. Similar restrictions did not apply to any of the other projects.

B-18. Average generation was developed by use of the most recent performance curves of the individual power plants as developed by the Power Production Section of the MRD Reservoir Control Center. For computer purposes, a relationship was defined between reservoir storage, outlfow, and tailwater levels unique for each power plant and each level of basin development. These are given in the detailed printouts of the regulation studies and not included in this report.

C. OPERATIONAL OBJECTIVES AND PROCEDURES

C-1. Maximum Release Rates. Maximum permissible mean monthly release rates used for these studies on the basis of present information on non-damaging channel capacities downstream, were as follow:

	Maximum Daily Mean Release During	
	Open Water	Ice Cover
Fort Peck	25,000 cfs	12,500 cfs
Garrison	75,000 cfs	30,000 cfs
Oahe	100,000 cfs	Power plant capacity
Big Bend	100,000 cfs	Power plant capacity
Fort Randall	100,000 cfs	18,000 cfs
Gavins Point	100,000 cfs	18,000 cfs from Fort Randall plus intervening inflow.

Open water release rates were further restricted from Gavins Point on the basis of downstream flood control considerations. From examination of runoff originating below Gavins Point a unique flood control release limit was defined for each month of the 1898-1972 period which was utilized to serve this important function of the main stem reservoir system.

C-2. The maximum release rates given above were based on flood control considerations. To the extent practicable, releases should be made through the power plants. Therefore, unless flood storage evacuation requirements dictated higher releases, open water releases were further limited as follow:

Fort Peck	14,200 cfs
Garrison	35,400 cfs
Oahe	45,000 cfs
Fort Randall	40,000 cfs

C-3. Minimum Release Rates. Minimum release rates were selected for these studies on the basis of present estimates of rates required to satisfy downstream water supply and water quality requirements and, to the extent practical, consistent with the level of basin development, to maintain flow rates above those minimums to enhance water supply, fish and wildlife and the downstream environment. Selected minimum releases from individual projects are as follow:

a. Fort Peck.

(1) An absolute minimum of 3,000 cfs at all times.

(2) When navigation was being served and in Study 1-74-MAX-ULT a minimum of 10,000 cfs during the March-July period, provided Fort Peck storage was above selected levels and storage space was available in Garrison.

(3) Following full-length navigation seasons a release of 11,300 cfs in December, a release of 12,500 cfs in January, February and the first half of March, and a release of 10,500 cfs during the period 15-22 March.

(4) When full-length navigation was not being served, a minimum of 7,500 cfs (5,000 cfs in study 1-74-MAX-ULT) provided Fort Peck storage exceeded selected levels and also exceeded the storage contained in Garrison.

b. Garrison.

(1) An absolute minimum of 6,000 cfs at all times.

(2) When navigation was being served, a minimum of 10,000 cfs during the March-July period.

(3) When navigation was being served, a minimum of 10,000 cfs during the August-November period except for the 2020 level studies where this minimum was reduced to 7,500 cfs.

(4) Following full-length navigation seasons a release of 22,500 cfs in December, 27,500 cfs in January, 30,000 cfs during February and the first half of March, and a release of 22,000 cfs during the period 15-22 March.

(5) Following less than full-length navigation seasons a minimum non-navigation season release of 10,000 cfs.

(6) During years no navigation service was provided, a minimum release of 10,000 cfs for all 1970 and 1980 level studies as well as studies 1-74-2000 and 1-74-2020. Study 1-74-2020, D3000 and study 1-74-MAX-ULT considered this minimum to be 6,000 cfs while the remaining studies had a 7,500 cfs minimum release.

(7) When full-length navigation was not being served, a minimum release of 17,500 cfs for studies 1-74-1970 through 1-74-2000, 15,000 cfs for studies 1-74-2000, D700 through 1-74-2020, D3000 and 10,000 cfs for study 1-74-MAX-ULT, provided Garrison storage exceeded selected levels and also exceeded the storage space contained in Oahe.

c. Oahe.

(1) An absolute minimum release of 6,000 cfs at all times.

(2) When navigation service was being provided, the minimum release was equal to the current navigation service level less 15,000 cfs, unless smaller releases were required to attain the late fall drawdown of the Fort Randall pool.

d. Big Bend. Releases from this project were always equivalent to the Oahe releases plus intervening inflow less Big Bend evaporation. Therefore, minimums established for Oahe were also essentially effective for Big Bend.

e. Fort Randall.

(1) An absolute minimum release of 6,000 cfs (5,000 cfs in study 1-74-MAX-ULT) during the April-November period and 5,000 cfs during the winter season.

(2) When navigation service was being provided, as necessary to sustain the selected service level without any change in Gavins Point storage.

(3) During years navigation service was being provided, non-navigation releases at a level consistent with the navigation service, based on the amount of water in storage in September.

f. Gavins Point.

(1) As necessary to maintain required water quality flows at downstream locations.

(2) As necessary to maintain the selected service level for navigation.

(3) As necessary to pass minimum Fort Randall releases without change in Gavins Point Storage.

C-4. Intermediate release rates. Release rates between the maximum and minimums given in preceding paragraphs were usually required. These rates were based on numerous criteria designed to most efficiently utilize the storage space available in each of the main stem reservoirs. Functional considerations considered in developing the criteria included flood control, navigation, hydroelectric power generation as well as the orderly evacuation of storage space following large inflow events. Reference is made to detailed study printouts and the program manual for these detailed criteria.

C-5. Supply for Water Quality Control. At all reservoirs above Fort Randall, selected minimum releases were more than adequate to meet estimated water quality control requirements in the affected downstream reaches. During the navigation season, the required releases from Fort Randall and Gavins Point were well in excess of those required for such purposes. During the non-navigation periods, releases from Fort Randall in excess of the selected minimum were scheduled when necessary to maintain the variable minimum water quality control requirements at Sioux City, Omaha, or Kansas City, whichever was controlling at the time. Minimum flow requirements to meet water quality needs, as furnished by the FWPCA, were as follows:

	Flow in cfs			
	1970	1980	2000	2020
Sioux City	3,000	1,000	1,000	1,000
Omaha	7,500	3,000	3,500	4,000
Kansas City	9,000	2,000	3,000	4,000

For the 1970 study it was assumed that the requirements given above were applicable for the summer months, June through September. During the winter period, December through February, requirements were 60 percent of the above while during the remainder of the year (spring and fall seasons) requirements were 45 percent of the above. For studies beyond the 1970 level, requirements as given above were assumed to be continuous throughout the year. The above requirements were established by the FWPCA in 1969 after consideration of current and projected sewage treatment practices along the river and the maintenance of satisfactory dissolved ozygen levels in the river.

C-6. Municipal Water Supply. It was assumed that minimum releases from each project and from the system (usually 6,000 cfs or more from Gavins Point) in combination with system releases necessary to maintain downstream water quality at acceptable levels, would be sufficient to provide for downstream municipal needs. While such an assumption would result in an adequate supply for these needs, problems of access would probably occur, requiring modification in supply intakes, particularly at future development levels.

C-7. Water Supply for Navigation. The authorized 9-feet deep by 300-feet wide navigation channel on the Missouri River from Sioux City to the mouth is still under construction. Until this construction is completed and sufficient time elapses to complete the work of forming the navigation channel, the exact magnitude of flows required for satisfactory navigation cannot be determined. Operating experience to date has indicated that progressively higher flow levels are required to maintain similar loading depths from upstream to downstream portions of the navigation project. While no increase appears necessary between Sioux City and Omaha, the increase amounts to 6,000 cfs between Omaha and Nebraska City and 4,000 cfs between Nebraska City and Kansas City. The main stem reservoirs are currently being regulated to provide these increased flow levels and these studies assume the requirements will continue. As yet, no flow increase other than that which naturally occurs has been established for locations below Kansas City. The studies utilize navigation target flow rates of 25,000 to 31,000 cfs at Sioux City and Omaha, 31,000 to 37,000 cfs at Nebraska City and 35,000 to 41,000 cfs at Kansas City, depending on the amount of storage in the main stem reservoir system. While flows above these levels could possibly benefit navigation by minimizing dredging and permitting greater loading depths, they were utilized in the studies only as a storage evacuation measure. No service was provided the navigation function in the study of maximum ultimate depletions.

C-8. Inflows to specific reaches below the main stem system will supply a portion of the necessary flows required to sustain navigation. In practice, these inflows are forecast and system releases adjusted accordingly. Since the downstream navigation targets are considered "floors" for resultant flows, all of the water which originates in each reach is not usable. Forecast errors resulting from procedures, or caused by rainfall for which compensation in release rates is not possible, result in navigation flows averaging above the selected targets over an extended period of time. Examination of actual regulation practice during the past several years indicates that the portions of downstream reach inflow which can be utilized for maintenance of targets are as follow:

Gavins Point to Sioux City	87 percent
Sioux City to Omaha	60 percent
Omaha to Nebraska City	67 percent
Nebraska City to Kansas City	60 percent

It was assumed that these percentages would continue applicable in all the studies.

C-9. The level of navigation flows to be maintained was related to the experienced long-term average flows at Sioux City resulting from application of specific downstream targets. With the increases in target flow level necessary to give comparable loading depths as one progresses downstream, given in paragraph 5 above, experience has indicated that the long-term average Sioux City flow will be 4,000 cfs greater than the Sioux City and Omaha target, 2,000 cfs less than the Nebraska City target and 6,000 cfs less than the Kansas City target. The average Sioux City flow necessary to maintain a specific and related target flows at the navigation control points given above has been designated as the navigation service level. This service level was allowed to vary from 29,000 cfs up to 35,000 cfs, dependent upon system storage on 15 March and on 1 July as indicated in the table below.

Date	CFS	System Storage 1,000 AF
15 March	35,000	56,150 or more
	29,000	47,700 or less
1 July	35,000	59,000 or more
	29,000	50,600 or less

The above table was considered applicable for all levels of basin development during which the navigation function was served. Intermediate levels of navigation rates at Sioux City were determined by straight line interpolation. A decrease in the average rate selected at the beginning of the season was permitted only on the basis of 1 July storage conditions. However, in addition to the 1 July date, an increase up to the 35,000 cfs service level could be made at any other time during the season if inflow occurred in such a manner that evacuation of flood control storage became a prime consideration.

C-10. The length of the navigation season was established on the basis of total system storage at the end of the months, March through June. Any required shortening of the season was made at the end of the season; in this manner, the season would always open on 1 April at the mouth of the Missouri River, but could be shortened to close before the eight-month, 1 December date. Criteria defining the navigation season length differ for each of the 13 studies in which navigation was considered to be served. Reference is made to the detailed printouts and program manual for details. These criteria resulted in navigation season lengths extending from as little as 4 months duration up to full-length 8-month season. Increments of season length were quarter-month intervals. A four-month season was considered to be the shortest season that would enable the navigation function to continue. If storage conditions were such that a season shorter than four months was indicated, navigation would be terminated entirely that year with termination based on system storage at the beginning of the year. When terminated,

navigation service was not resumed until system storage at the beginning of the year exceeded values specified by criteria.

C-11. Additional rules relating to the length of the navigation season incorporated in the criteria were as follow:

a. At least one month's notice must be provided before the navigation season is lengthened. For example, if indications on 31 May are that the navigation releases should end on 30 June, the season will not be extended beyond 30 June, even though storage on this latter date would indicate an extension was possible.

b. At least two month's notice must be provided before the navigation season is shortened. For example, if, on 30 April, criteria indicate that navigation releases should end on 31 July, the season will not be shortened prior to this date on the basis of storage on 31 May.

c. Navigation service levels during shortened seasons were always at the established minimum.

d. An exception concerning the ending date of the navigation season was that, if inflows and storage balance among the projects were such that the maintenance of a navigation season length of less than eight months required system releases in excess of the minimum navigation level, the season was increased the extent necessary to restore the required balance while maintaining minimum navigation flows.

e. If an excess water supply required storage evacuation at rates exceeding the maximum service level for a full 8-month season, a ten day extension was provided at the end of the navigation season.

C-12. Flood Control Regulation. The selected maximum releases for all projects above Gavins Point were assumed to provide effective flood control regulation through their immediate downstream reaches. At Gavins Point, the flood control function of the system was recognized by limiting releases throughout the entire record period to the levels which were believed necessary for flood control purposes. The downstream flood potential was determined for each month of the entire record period and converted into maximum allowable flows at Sioux City which restricted reservoir releases. In addition, the flood control function of the system was recognized by extending the navigation season (as discussed in a previous paragraph) and providing a moderate increase in winter release rates (as discussed later) during years of an excess water supply. The evacuation of project and system storage to the base of flood control zones (with allowance for upstream replacement storage) was a regulation objective in all studies.

C-13. Accumulation of System Storage. Prior to 1 August, releases exceeding the 35,000 cfs service level were made only after it became apparent that sufficient storage had been accumulated in the annual flood control and

multiple-use zone of the system to satisfy all full-service downstream requirements to the succeeding 1 March. When it was apparent the above objective could be met (including a ten-day extension of the navigation season and winter releases at above full-service levels), system releases were increased up to those permitting a 40,000 cfs release from Fort Randall (approximate power plant capacity). Only after a continuation of this amount of release from Fort Randall through the remainder of the navigation season appeared probable were system releases increased upward toward the maximums permitted by flood control considerations.

C-14. Evacuation of System Storage. After 1 August, system releases in excess of the 35,000 cfs full-service level were made only when such appeared necessary to evacuate the annual flood control and multiple-use storage space prior to the succeeding 1 March, with a 10-day extension of the navigation season and above full-service winter releases. Excess releases were based on an orderly evacuation of the excess storage prior to the winter season.

C-15. Non-Navigation System Release Rates. Non-navigation season releases from Gavins Point were equal to Fort Randall releases plus the incremental inflow to Gavins Point, as Gavins Point Reservoir was operated at a constant pool. Following full eight-month navigation seasons, the Fort Randall winter releases were determined on the basis of the table below:

Winter Releases

Condition	Fort Randall Winter Release CFS
Excess Water Supply conditions*	18,000
1 September System Storage:	
58,000 AF or more	15,000
43,000 AF or less	5,000

*Excess water supply is assumed to occur at any time releases greater than the full service level are necessary (even with a 10-day extension to the normal 8-month navigation season) in order to evacuate flood control storage space.

Intermediate winter release rates (between the 5 and 15 thousand cfs level) were determined by interpolation of the above table. This table, in combination with the tables designating average navigation rates at Sioux City, resulted in winter releases being approximately 20,000 cfs less than the average navigation rates over a long-term period. Following navigation seasons of less than 8 months duration, a non-navigation release of 5,000 cfs was maintained from Fort Randall. During those years that no navigation service was provided, minimum Fort Randall releases were 6,000 cfs (5,000 cfs in study 1-74-MAX-ULT) during the April-November period and 5,000 cfs during the remainder of the winter period, with releases above these

minimums required only for the evacuation of flood control storage space.

C-16. Storage Balance. Regulation procedures were based on maintaining balanced storage within the major projects (Fort Peck, Garrison and Oahe). Big Bend and Gavins Point were assumed to remain at a constant level through the study period while at Fort Randall the general seasonal storage pattern was independent of the water supply available to the system as a whole. Major project storage targets, representing balanced storage levels on the 1 March date consistent with the system target for that date, were utilized for regulation. The maximum system target was at the base of the annual flood control and multiple-use zone, increased by the amount of replacement storage space provided in upstream tributary reservoirs. System targets equal to or less than the maximum were selected on the basis of current system storage, current release levels and the normal inflows occurring into the system between the current date and 1 March. Releases in excess of any individual powerplant's capacity were not made to achieve storage balance among the major projects.

C-17. During years in which the navigation function was not served and in those years that full 8-month navigation seasons were not provided, balanced storage was considered to be approximately the same amount of storage in each of the three major reservoirs. Upstream reservoir releases between minimums and selected values well within the powerplant capacity were made to achieve this balance.

C-18. Fort Randall Storage Drawdown and Refill. During all years that service was provided the navigation function or years that system releases during the normal navigation period were above the minimums required for downstream water supply, a fall drawdown of Fort Randall was provided. Subsequent refill during the winter months resulted in increased winter energy production than would otherwise be possible. During years that navigation was being served, the maximum drawdown level (occurring at the end of the navigation season) varied from elevation 1337.5 to elevation 1320. Drawdown below elevation 1337.5 was only in those years when system releases during the non-navigation season were well below the full-service level. In years that navigation service was not being provided, deliberate Fort Randall drawndown below elevation 1350.0 occurred only when storage evacuation prior to the winter season required system releases above the established minimums. Refill of the storage space in Fort Randall resulting from the drawdown was scheduled during the December-February winter period. Additionally, the Fort Randall pool was allowed to rise up to elevation 1353, or three feet above the base of the flood control zones, during the winter months in all studies except 1-74-MAX-ULT.

C-19. Hydropower Load Curves. Energy requirements could increase the level of releases at any of the projects other than Fort Randall and Gavins Point. Specific energy targets for each period were developed, with these targets being dependent on the navigation flow level being maintained at Sioux City and, when a season of less than eight months occurred or was anticipated,

the targets were dependent on the length of the navigation season. The monthly variation in energy targets was in accordance with the load curve furnished by the Bureau of Reclamation.

D. SUMMARY OF RESULTS

D-1. Conclusions, resulting from an analysis of these studies, are given below.

D-2. Flood Control. The studies demonstrate that the reservoir system with assigned flood control storage capacities is fully effective for flood control at all development levels for all runoff conditions experienced during the 1898-1972 period. A reserve of exclusive flood control storage space was maintained at all times while maximum releases were limited to less than 25,000 cfs from Fort Peck and less than 75,000 cfs from Garrison. Sioux City flows were at all times at or below the level permitted by the downstream flood potential, and storage was evacuated to near or below the base of flood control (with allowance for replacement storage space) prior to the spring flood season of each year.

D-3. Irrigation. In all studies sufficient releases were maintained from the reservoirs to meet requirements for irrigation below the projects. The effects of the increasing development of irrigation projects on inflows to the system, and on withdrawals and releases from the system, were considered throughout the studies. Large-scale irrigation projects, utilizing water directly from the reservoir in the system, were assumed to begin operation after the 1970-level of water resource development. Study 1-70-MAX-ULT illustrates that additional irrigation beyond that most likely by the year 2020 could be served. This study illustrates that depletions above Sioux City amounting to about 10 million acre-feet annually beyond the 1970 level would be possible prior to the time that insufficient water would be available to serve downstream water supply or water quality needs throughout the available period of hydrologic record. The limiting factor at this level of depletions is the water supply need below Garrison which is assumed to require a minimum release rate of 6,000 cfs.

D-4. Coal Development. Adequate water is available to serve anticipated maximum needs for this purpose as well as for irrigation beyond the 2020 development level.

D-5. Water Quality Control. Water quality control requirements on the Missouri River were met throughout the study period for all development levels. During all navigation periods and during non-navigation periods with adequate storage reserves, releases for other purposes exceeded the water quality control requirements. During non-navigation periods these water quality requirements (and water intake requirements) established minimum releases. During those years system releases were based on water required for power peaking operations, such releases alone generally resulted in flows above the minimum necessary to meet the water quality control requirements.

D-6. Downstream Water Supply. Minimum releases maintained in each of the studies were adequate to meet the minimum water supply requirements at all downstream locations.

D-7. Navigation. At the 1970 level of water resource development it was possible to maintain full 8-month navigation seasons for 66 years of the 75 year record period. During the remaining years (coinciding with the effects of the severe drought of the 1930's) it was necessary to reduce season lengths to a minimum navigation season of 5-3/4 months duration. Increasing water resource development had a significant effect upon service provided the navigation function. At the 2020 development level, with probable maximum coal development, full 8-month navigation seasons were possible for only 24 years of the 75-year record period. It was necessary to eliminate navigation entirely during 11 years (from 1933 through 1942, inclusive, and during 1962). There was no attempt to provide navigation service in study 1-74-MAX-ULT. The tabulation given on page 25 presents data on navigation season lengths for each of the studies in which navigation was assumed to be a system function.

D-8. While the length of navigation seasons, as discussed above, is one measure of relative service provided the navigation function, releases for navigation may vary between those required for minimum service to this function up to the full-service level. Consequently an index to service is the average season-service level provided over the entire 75-year record period. Full-service releases for a full 8-month navigation season is represented by a navigation season-service level of 35,000 cfs. A 10-day extension to a full-service navigation season would result in a slightly higher season-service level. A season-service level of 30,000 cfs could correspond to service level of 30,000 cfs for a full 8-month season, a 35,000 cfs full-service level of releases for a 6.9-month season, or other combinations. If no navigation service is provided, the season-service level is 0. The average season-service level for each of the studies was as follows:

Study	Avg. Annual Depletions In Excess of 1970 Level Above Sioux City, 1,000 AF	Avg. Season-Service, 1,000 cfs
1-74-1970	0	32.9
1-74-1980	991	31.8
1-74-1980, D700	1,091	31.7
1-74-1980, D1400	1,191	31.6
1-74-1980, D3000	1,393	31.3
1-74-2000	2,589	29.3
1-74-2000, D700	3,129	28.7
1-74-2000, D1400	3,669	27.8
1-74-2000, D3000	4,994	26.0
1-74-2020	3,416	27.8
1-74-2020, D700	4,116	26.9
1-74-2020, D1400	4,816	25.9
1-74-2020, D3000	7,031	22.0
1-74-MAX-ULT	9,813	0.0

EFFECTS OF PROJECTED DEPLETIONS ON NAVIGATION

Season Length in Months	Years of Expected Service for Projected Level of Development and Time Frame												
	Current	Base w/o Coal			Minimum Projection			Most Likely Projection			Maximum Projection		
	1970	1980	2000	2020	1980	2000	2020	1980	2000	2020	1980	2000	2020
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
8	66	62	54	51	62	52	51	62	51	48	58	48	24
7.75		2			2	1		1		2	4		5
7.5			1			1		1		1	1	1	4
7.25	1	2		1	1	1					1	2	6
7			1	3	1	1		2	4				3
6.75			2			2	2			2	2		5
6.5			2	1			1		1				2
6.25	2		3			4	1					1	1
6	2			2		1	2			3			
5.75	4	1	1	5	1	1		1	5	2		2	4
5.5		1	1		1		4	1	1	1	1	3	
5.25		2	1	1		2	1		1	3		5	
5		1		2	3		1	3		1	1	1	
4.75		4			4			2	1		7	1	
4.5							2	2	2			2	2
4.25			1				1			2			
4			7	7		7	6		7	5		4	8
Zero			1	2		2	3		2	5		5	11
Total No. of Years	75	75	75	75	75	75	75	75	75	75	75	75	75

D-9. Hydroelectric Power. Pertinent information relating to the hydropower function of the main stem system are presented in the table below. Nameplate rating of the system is 2,048 megawatts.

Study	Peaking Capability Megawatts			Average Generation			
	Jul Avg	Dec Avg	Dec 1933	Summer (May-Oct) Megawatts	Winter (Dec-Feb) Megawatts	Annual (Jan-Dec) Megawatts	Million KW Hours
1-74-1970	2176	2147	1940	1158	967	1068	9371
1-74-1980	2180	2151	1894	1130	924	1040	9123
1-74-1980, D700	2178	2148	1887	1124	921	1034	9073
1-74-1980, D1400	2176	2146	1897	1116	919	1029	9028
1-74-1980, D3000	2173	2142	1905	1108	905	1019	8937
1-74-2000	2195	2189	1993	1078	874	991	8692
1-74-2000, D700	2174	2164	1931	1043	847	959	8412
1-74-2000, D1400	2178	2168	1994	1003	828	930	8150
1-74-2000, D3000	2164	2136	1872	916	762	854	7492
1-74-2020	2140	2112	1884	1034	794	928	8137
1-74-2020, D700	2131	2097	1847	969	770	889	7800
1-74-2020, D1400	2114	2067	1808	928	728	849	7451
1-74-2020, D3000	2030	1974	1775	807	581	714	6262
1-74-MAX-ULT	2229	2217	2184	620	596	587	5149

Due to the severe effect of the 1930-1941 drought period, median values for capability and generation are significantly greater than the averages given above for all studies.

D-10. Fishery Enhancement. Sport Fishing is an important activity associated with the main stem reservoirs with continuation dependent upon spawning of the desirable species within the reservoirs. Based on experience to this time the following appear to be desirable factors for the enhancement of spawning activities:

a. A relatively long water exchange period in Gavins Point (low releases) during the spawning and maturation period.

b. The elimination of hourly release variations from Fort Randall during the sauger-spawning period.

c. Increasing or stationary pool levels inundating previously established vegetation during the northern pike spawning period.

d. Rising or stationary pool levels during the spring and early summer at which time most species spawn.

D-11. Gavins Point release rates are in general directly related to the water supply available to the main stem system and inversely proportional to the magnitude of upstream depletions. It is evident that as upstream depletions increase, the general release level will be lowered. Therefore, the fishing in this project should be enhanced as basin development progresses. The table below illustrates the results of this development as defined by the various regulation studies.

Study	Percent of Time Gavins Point Releases Exceeded			
	35,000 cfs	30,000 cfs	25,000 cfs	20,000 cfs
1-74-1970	19.4	38.2	60.0	73.4
1-74-1980, D1400	17.8	37.5	57.6	68.8
1-74-2000, D1400	9.4	30.8	48.2	60.1
1-74-2020, D1400	5.6	23.3	39.5	51.6
1-74-MAX-ULT	1.3	10.5	15.5	21.8

D-12. Maintaining relatively constant Fort Randall releases during the sauger spawning period is incompatible with the power peaking function of the main stem and, in future years, the value of this peaking capability is expected to increase. With an essentially full reservoir system, about 16 percent of peak load requirements can be met by Fort Randall generation. This percentage increases as storage reserves are diminished to over 20 percent when system storage is evacuated to near minimum allowable levels. This incompatability is present at all levels of basin development, although it will probably be more extreme with increasing basin development due to the increased value of the peaking capability at those times. With this exception, the ability to maintain relatively constant releases from Fort Randall throughout the day during the sauger spawning period should not be adversely affected to any great extent by depletions to the water supply resulting from continued basin development. The average releases during the spawning period will be lower as basin development increases, resulting in a somewhat smaller spawning area in the downstream reach.

D-13. Successful northern pike spawning requires the inundation of previously established terrestial vegetation during the early spring period. Due to the relatively small amounts of storage transfer necessary for pool-level manipulations, regulation of Gavins Point, Big Bend and Fort Randall specifically for northern pike propagation can be scheduled at relatively frequent intervals provided adverse effects upon other system functions are not too severe. At the upstream Fort Peck, Garrison and Oahe projects deliberate manipulation of pool levels to first establish terrestial vegetation and second, to inundate this vegetation during the northern pike spawning period, is very difficult if not impossible without serious adverse effects upon other project purposes. Therefore, successful northern-pike spawn in these projects appears to be almost entirely dependent upon water

supply conditions, with only a minor enhancement possible through deliberate reservoir operation. A discussion of this matter for the individual projects with increasing basin development follows.

a. Fort Peck. It was assumed that conditions would be favorable for successful northern pike spawning if the reservoir level at the end of May was higher than at any time during the preceding July-December period, during which time terrestial vegetation was being established. Under 1970 conditions (Study 1-74-1970) there were only 5 times in the 75-year record period when these favorable conditions occurred. However, as basin development increased, there was an increase in the number of years that favorable conditions occurred. There were 7 occurrences in study 1-74-1980, D1400; 13 occurrences in study 1-74-2000, D1400; and in study 1-74-2020, D3000 there were 24 years during the 75-year record period when conditions appeared favorable for northern pike spawning. With the maximum ultimate depletions, favorable northern pike spawning conditions occurred in 27 years of the examined record.

b. Garrison. It was assumed that successful spawning at this project required conditions similar to those described for Fort Peck with the exception that vegetation would have to be inundated by the end of April rather than at the end of May. With 1970 basin development (Study 1-74-1970) there were only four years in the 75-year record period during which favorable northern pike spawning conditions occurred. The effects of further basin development upon pike spawning in this project were generally minimal. In study 1-74-2020, D3000, there were only six favorable years in the available record period. However, study 1-74-MAX-ULT indicated that favorable northern pike spawning conditions would be established in 14 years of the 75-year record period.

c. Oahe. Successful northern pike spawning at this project was assumed to require conditions similar to those described for Garrison. It appears that favorable conditions for spawning will occur at frequent intervals for all levels of basin development. Studies 1-74-1970 and 1-74-2020, D3000 both had 33 years of favorable conditions during the 75-year record period. Similar favorable conditions occurred at all other levels of basin development. There were 47 years of favorable conditions for northern pike spawning in the study examining the maximum ultimate depletions.

D-14. While conditions required for the spawning of northern pike appears to occur most infrequently at Garrison for all levels of basin development, this project would appear to be the most ideal for reproduction of other species that do not require submerged terrestial vegetation. For all levels of basin development the studies indicated that a steady or rising Garrison pool through the April-July period should occur in about 2 out of every 3 years. At Fort Peck steady or rising pools occurred during 20 to 25 years of the 75 year record period for all development levels while a steady or rising Oahe pool during the entire April-June period occurred in only about 15 of the 75 years examined.

D-15. Recreation and Environment. While water based recreation would be possible at all projects as long as minimum pools were maintained, it would be enhanced with pools near full. Environmental factors are also enhanced with higher pool levels. In general, this series of studies indicates that increasing depletions, when combined with the water required to sustain navigation below the main stem system, results in lower average pool elevations of the major projects and a greater fluctuation in the levels from year to year. However, when depletions have grown to such an extent that continuation of the navigation function appears impracticable, the major projects can be maintained at high and relatively constant pool levels except during major drought periods, as illustrated by pool elevation hydrographs shown on Plate 16. A further discussion of increasing basin development while continuing to serve navigation on individual project, pool elevations as relating to recreational use and environmental considerations follows.

a. Fort Peck. These functions are assumed to be well served with a pool level of elevation 2236, plus or minus ten feet. Study 1-74-1970 indicated that the Fort Peck level would be in this range 67 per cent of the time. The severe extended drought of the 1930's resulted in lower pool elevations during most of the 1930-1947 period while the drought of the late 1950's caused lower elevations during the 1956-1963 period. During the remainder of the 75 year record period pool levels were generally above elevation 2226. Increasing water resource development will have some effect upon these pool levels. Study 1-74-2020, D1400 (most likely 2020 development) indicated that the pool would be in the elevation 2226-2246 feet range for 56 per cent of the time. In addition to the drought periods discussed above, pool levels below elevation 2226 occur at other times.

b. Garrison. Study 1-74-1970 resulted in a Garrison pool in the range of elevation 1830 to 1850 for 70 percent of the time. Pools below elevation 1830 occurred from 1931 through 1943 and during portions of the 1955 through 1963 period. With increasing basin development, average pool levels maintained in this project were significantly lowered. Study 1-74-2020, D1400 indicated that the pool would be in this 20-foot range of elevation for 48 percent of the time.

c. Oahe. The level of this lake is estimated to be in the range of elevations 1596 to 1616 for 70 percent of the time under current (1970) levels of basin development. Increasing water resource development appears to have a greater effect on elevations of this project than on any of the other main stem reservoirs. Under most likely 2020 conditions the reservoir level would be in the indicated range for only 39 percent of the time.

d. Fort Randall. At all levels of basin water resource development this project should have water levels in the 1340-1360 feet range through a major

portion of the open water season. Exceptions to this will occur only during those years that the navigation season is shortened to significantly less than its normal eight-month length. With shortened navigation seasons it is necessary to begin the annual drawdown of the reservoir at an earlier than normal date. During those years that service to navigation is eliminated entirely, the annual drawndown of the Fort Randall pool will not be made.

e. Big Bend and Gavins Point. These projects will be regulated at relatively constant levels at all times.

D-16. Summary of Results. Summary sheets for each of the 14 studies are attached as Plates 1 through 14. These sheets indicate the 1898-1972 average of data elements, by months, pertinent to each of the reservoirs and to river locations downstream from the reservoirs. Detailed month-by-month computer printouts for individual years of the 1898-1972 record period are on file in the Missouri River Division Reservoir Control Center. In addition the files contain summaries of specific portions of the available record period (such as for the 1930's drought and refill period). Duration data are also available for pool levels, system storage, project releases, power generation, peaking capability and flows at downstream locations for each of the studies. Due to their voluminous nature they are not included in this report.

D-17. Plate 15 is a plot of pool level variations at Fort Peck, Garrison, Oahe and Fort Randall reservoirs as developed by study 1-74-1970. It is included to illustrate typical variations in these levels through the period of available record, and is illustrative of fluctuations that occur while serving all project purposes, including navigation. Plate 16 presents similar data for study 1-74-MAX-ULT, illustrating the effects of the maximum ultimate depletions and discontinuance of navigation service upon project pool levels. Plates 17 through 30 are plotted data from each of the studies indicating the Sioux City flows, system storages, system releases, service to navigation and service to power resulting from each of the 14 studies.

SUMMARY, STUDY 1-74-1978 PERIOD 1978:A1978

	30MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	19NOV	30NOV	31DEC	31JAN	28FEB	19MAR
FORT PECK															
REACH INF,1000AF	7281	172	291	678	1112	1024	797	383	332	985	181	101	325	327	395	197
EVAP,1000 AF	0	0	0	0	0	21	89	90	84	87	28	28	21	0	0	0
INF ADJ,1000AF	-683	0	0	-0	-237	-205	-638	0	87	13	20	1	88	77	2	2
MOD INF,1000AF	6598	172	292	678	875	819	159	293	335	341	179	179	309	399	463	199
STORAGE,1000AF	14983	13819	13811	13676	13703	14743	14078	14077	14039	14190	14392	14562	13763	13881	13944	13988
POOL ELEV,FT MSL	2226.9	2220.7	2220.7	2220.4	2220.7	2222.6	2221.1	2221.1	2221.0	2221.2	2221.9	2222.5	2220.7	2220.1	2222.8	2222.8
RELEASE,1000AF	4331	130	132	433	618	574	494	510	472	680	223	286	644	717	680	398
RELEASE,1000CFS	6.9	2.1	2.2	7.0	10.0	9.3	7.9	8.3	7.7	11.0	3.6	4.6	10.5	11.7	10.9	6.5
AVERAGE POWER,MW	116	128	98	97	91	88	71.6	8.4	7.9	7.8	7.3	7.6	10.5	11.7	10.1	12.1
PEAK POWER,MW		186	186	187	188	188	188	188	188	188	188	188	187	188	188	187
ENERGY,1000MWH	1019.3	21.6	21.4	70.8	67.7	61.3	74.6	8836	77.8	97.3	35.8	4467	104.9	119.2	107.9	90.9
GARRISON																
REACH INF,1000AF	11154	308	396	1168	1327	3810	1999	681	487	819	283	283	269	304	385	378
EVAP,1000 AF	912	0	0	0	33	84	99	106	98	66	29	29	24	0	0	0
INF ADJ,1000AF	-646	22	29	18	-120	-626	-194	-89	-31	-13	15	19	21	26	19	23
MOD INF,1000AF	10332	487	597	1611	1591	2731	1947	1861	830	920	412	479	907	1849	1885	784
STORAGE,1000AF	17095	15972	15813	14365	14773	16439	16834	16831	17050	17377	17196	16998	16508	15978	15493	15378
POOL ELEV,FT MSL	1831.3	1826.4	1827.3	1829.8	1830.9	1836.0	1837.1	1837.1	1837.6	1836.8	1832.4	1831.4	1830.7	1829.4	1827.6	1826.0	1825.7
RELEASE,1000AF	16328	986	914	1061	1181	1065	1993	1914	1311	1393	640	727	1207	1988	1964	888
RELEASE,1000CFS	22.9	28.7	17.6	17.8	19.2	17.9	3013	24.6	22.0	22.7	21.5	2414	21.1	28.7	27.9	28.1
AVERAGE POWER,MW	263	234	206	210	223	212	392	396	263	267	249	281	247	296	317	330
PEAK POWER,MW		402	402	411	415	428	430	426	423	420	417	419	412	407	401	400
ENERGY,1000MWH	9387.0	39.9	44.6	151.3	166.6	193.0	2177	288.3	196.0	199.4	89.9	1[0].2	184.8	228.9	219.1	114.0
OAHE																
REACH INF,1000AF	2281	196	193	478	279	472	188	83	124	66	38	38	-26	6	47	189
EVAP,1000 AF	424	0	0	0	31	81	82	86	79	51	24	24	20	0	0	0
INF ADJ,1000AF	-227	-10	-9	-7	-40	-79	-28	0	-1	0	0	0	45	29	-8	-84
MOD INF,1000AF	17927	426	469	1468	1384	1041	1632	1488	1394	1416	693	748	1298	1612	1402	971
STORAGE,1000AF	16662	17464	17924	17951	17395	17334	17174	16711	16191	16086	15989	16021	15511	15883	16461	17296
POOL ELEV,FT MSL	1596.4	1598.8	1598.9	1598.6	1598.7	1598.6	1598.3	1598.0	1596.4	1596.1	1596.0	1596.0	1592.7	1595.8	1596.9	1597.1
RELEASE,1000AF	17928	192	459	1438	1581	1481	1792	1905	1922	1480	730	707	1808	1939	849	399
RELEASE,1000CFS	24.7	13.8	22.9	24.2	25.7	24.6	29.1	31.5	32.3	24.1	23.8	23.0	29.4	31.2	15.1	12.0
AVERAGE POWER,MW	324	174	285	299	317	304	391	390	395	299	307	292	363	363	187	192
PEAK POWER,MW		647	646	648	639	637	634	630	627	631	633	634	629	634	642	644
ENERGY,1000MWH	2072.4	29.3	61.7	216.0	236.6	219.6	269.8	290.8	289.1	228.0	109.8	108.3	262.9	181.9	127.2	94.9
BIG BEND																
EVAP,1000 AF	72	0	0	0	9	0	13	14	13	9	4	4	3	0	0	0
AVERAGE POWER,MW	112	60	151	156	113	107	129	100	149	112	119	114	141	93	67	93
PEAK POWER,MW		494	486	484	482	484	480	476	906	937	937	938	930	906	496	499
ENERGY,1000MWH	983.3	10.2	82.0	76.6	84.1	77.7	96.1	10417	104.6	83.6	43.2	4[10	105.3	69.8	45.5	10.8
FORT RANDALL																
REACH INF,1000AF	836	66	89	137	139	196	99	88	31	9	11	11	-19	9	31	76
EVAP,1000 AF	78	0	0	0	6	4	16	16	16	9	3	3	2	0	0	0
INF ADJ,1000AF	-92	-4	-6	-19	-15	-19	-7	-5	-6	-2	0	0	0	0	-1	-5
MOD INF,1000AF	10513	254	469	1557	1670	1898	1812	1729	1919	1469	793	910	1784	1948	879	427
STORAGE,1000AF	3480	3711	3799	3816	3837	3813	3703	3981	3446	3981	2809	2403	3198	3993	3892	3797
POOL ELEV,FT MSL	1349.8	1353.1	1354.1	1354.5	1354.6	1356.3	1352.9	1358[0	1349.0	1361.0	1337.0	1334.7	1346.8	1351.7	1352.9	1353.1
RELEASE,1000AF	10953	391	469	1936	1669	1614	1921	2872	2834	2012	1891	813	991	891	778	432
RELEASE,1000CFS	25.6	10.1	22.7	29.8	27.2	27.1	31.3	33.7	34.2	32.7	30.3	30.7	16.1	13.0	12.8	13.8
AVERAGE POWER,MW	197	148	196	261	222	220	248	261	297	238	224	196	121	112	119	138
PEAK POWER,MW		335	339	339	342	339	333	325	317	285	267	254	306	329	334	339
ENERGY,1000MWH	1731.9	28.1	48.2	192.9	165.9	168.0	185.8	194.6	189.6	177.3	81.0	78.7	90.3	84.8	78.4	41.8

	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	19NOV	30NOV	31DEC	31JAN	28FEB	19MAR
GAVINS POINT															
REACH INF,1000AF	1417	56	72	196	148	173	103	93	89	126	45	45	77	79	103	84
EVAP,1000 AF	37	0	0	0	2	1	7	7	7	4	2	2	1	0	0	0
INF ADJ,1000AF	-101	-5	-5	-5	-12	-14	-14	-13	-13	-14	-3	-3	2	2	2	-4
RELEASE,1000AF	19791	323	472	1687	1852	1771	2005	2545	2102	2089	1071	1033	1049	933	882	471
RELEASE,1000CFS	27.3	21.0	24.9	28.4	29.3	28.8	32.6	34.9	35.3	34.1	34.7	31.0	17.4	19.2	18.7	15.9
AVERAGE POWER,MW	74	66	77	89	84	84	98	91	98	85	83	78	53	47	49	49
PEAK POWER,MW		88	94	96	97	97	97	97	95	93	92	89	80	73	74	78
ENERGY,1000MWH	657.4	11.2	16.7	59.3	62.7	60.8	65.8	68[0	64.9	63.9	30.[	28.4	39.8	35.4	33.4	17.8
MAIN STEM SYSTEM															
REACH INF,1000AF	24405	836	1074	2880	3224	5442	3093	1305	1137	1135	494	494	648	742	1003	992
EVAP,1000 AF	1569	0	0	0	157	97	309	321	299	201	91	90	74	0	0	0
INF ADJ,1000AF	-1436	-10	-21	-189	-438	-918	-379	-67	26	-9	37	17	70	123	87	-19
STORAGE,1000AF	93449	92132	92611	93394	94036	96498	96756	95897	94156	92935	92244	91933	91286	91283	91339	91731
AVERAGE POWER,MW	1068	814	974	1197	1075	1043	1261	1264	1200	1107	1079	1058	1057	948	895	863
PEAK POWER,MW		2154	2190	2189	2175	2143	2117	2117	2194	2194	2197	2122	2147	2138	2137	2189
ENERGY,1000MWH	9371.0	136.9	206.6	729.6	783.2	731.3	958.8	963.0	927.9	826.1	388.8	39[.3	786.8	706.3	607.1	383.8
SIOUX CITY															
REACH INF,1000AF	1543	82	109	273	229	324	164	182	72	49	80	20	21	14	74	73
INF ADJ,1000AF	-91	-2	-3	-13	-11	-11	-7	-13	-9	-2	0	0	0	0	-1	-3
MOD INF,1000AF	1491	79	101	260	213	312	156	169	63	46	80	19	21	14	72	70
FLOW,1000AF	21234	382	974	1947	2016	1979	2149	2284	2106	2145	1111	873	1090	948	954	581
FLOW,1000CFS	29.3	27.5	32.2	32.7	32.8	33.2	3[0	38.3	34.4	34.9	37.4	32.7	17.7	19.4	17.0	18.9
OMAHA															
REACH INF,1000AF	1312	44	76	171	117	196	196	105	87	58	34	34	43	38	76	92
INF ADJ,1000AF	-82	-2	-3	-10	-8	-13	-12	-6	-5	-3	-2	-2	-3	-2	-5	-3
MOD INF,1000AF	1250	41	73	160	109	182	184	99	81	55	32	32	40	36	70	87
FLOW,1000AF	22484	397	613	2106	2125	2197	2328	2380	2288	2205	1138	1026	1173	984	1027	683
FLOW,1000CFS	31.0	28.6	34.4	35.4	34.6	36.3	37.9	37.9	37.9	36.9	38.3	34.9	19.1	16.2	16.3	20.3
NEBRASKA CITY															
REACH INF,1000AF	5100	161	257	941	930	823	615	383	386	294	146	[46	274	322	317	199
INF ADJ,1000AF	-773	-33	-43	-156	-93	-139	-72	-82	-29	-45	-20	-28	-38	-28	-30	-38
MOD INF,1000AF	4327	127	163	437	457	68[	542	301	271	251	126	126	207	193	287	161
FLOW,1000AF	26811	516	772	2543	2582	2848	2868	2689	2528	2460	1261	1159	1380	1177	1292	749
FLOW,1000CFS	37.0	37.2	43.3	42.7	42.0	47.8	46.7	45[	42.5	41.3	42.4	39[0	22.6	19.3	21.1	25.2
KANSAS CITY															
REACH INF,1000AF	9659	218	280	933	1068	1630	1467	780	729	980	361	261	380	378	495	290
INF ADJ,1000AF	-803	0	0	-45	-135	-353	-198	-186	-54	-20	-2	-2	-8	-2	-9	0
MOD INF,1000AF	8855	218	281	888	933	1277	1269	593	675	960	359	259	372	376	486	290
FLOW,1000AF	35667	700	1035	3439	3515	4220	4142	3387	3223	3223	1510	1444	1815	1767	1731	972
FLOW,1000CFS	49.2	50.5	58.0	57.7	57.2	70.9	67.4	55.8	54.2	49.2	50.8	48.9	29.5	29.5	28.9	33.4
BOONVILLE															
REACH INF,1000AF	9989	185	238	847	710	752	560	282	414	385	190	190	323	312	382	289
INF ADJ,1000AF	-101	-4	-4	-22	-81	-23	-9	-3	-5	-2	-1	-1	-2	-1	-4	-3
MOD INF,1000AF	9884	181	234	824	629	729	554	279	413	388	189	189	320	311	378	286
FLOW,1000AF	41551	846	1269	4259	4264	4948	4689	3581	3639	3414	1699	1659	2158	1898	2099	1189
FLOW,1000CFS	57.4	60.9	70.0	71.6	69.4	83.2	76.3	58.2	61.2	55.5	56.8	54.0	35.1	33.7	37.9	40.0
HERMANN															
REACH INF,1000AF	11799	339	462	1567	1576	1311	978	586	754	819	356	356	695	801	767	483
INF ADJ,1000AF	-101	-24	-31	-91	-95	-92	-61	-99	-169	-79	-27	-27	-74	-28	-36	-27
MOD INF,1000AF	11693	315	431	1476	1480	1364	1360	685	921	740	329	329	621	772	728	376
FLOW,1000AF	53244	1154	1670	5734	5685	6311	6748	4264	4560	4156	2014	1988	2879	2647	2825	1582
FLOW,1000CFS	73.5	83.8	93.6	96.4	92.9	106.1	98.8	69.4	76.9	67.6	67.7	67.3	46.8	43.4	45.4	52.9

PLATE 1

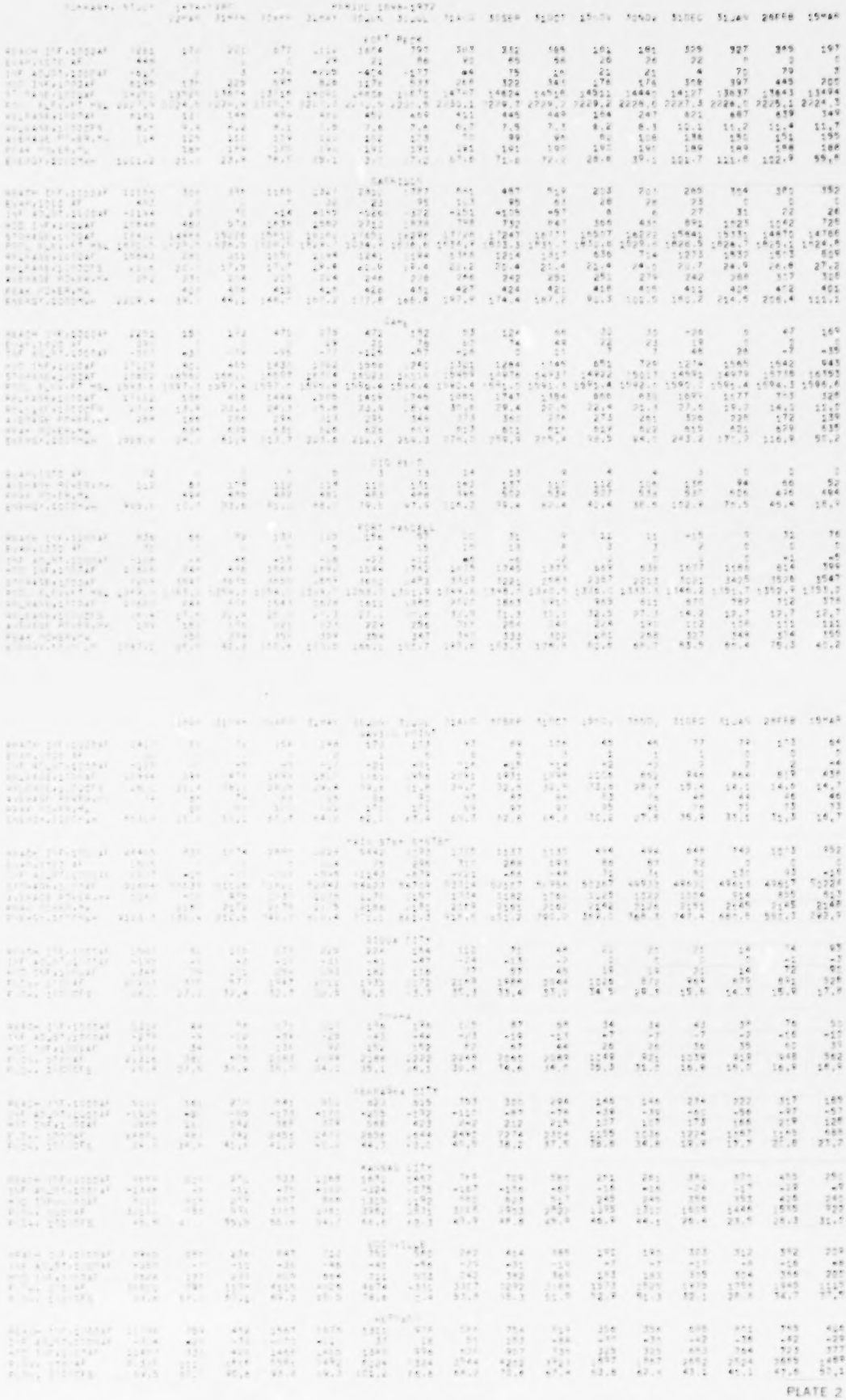


PLATE 2

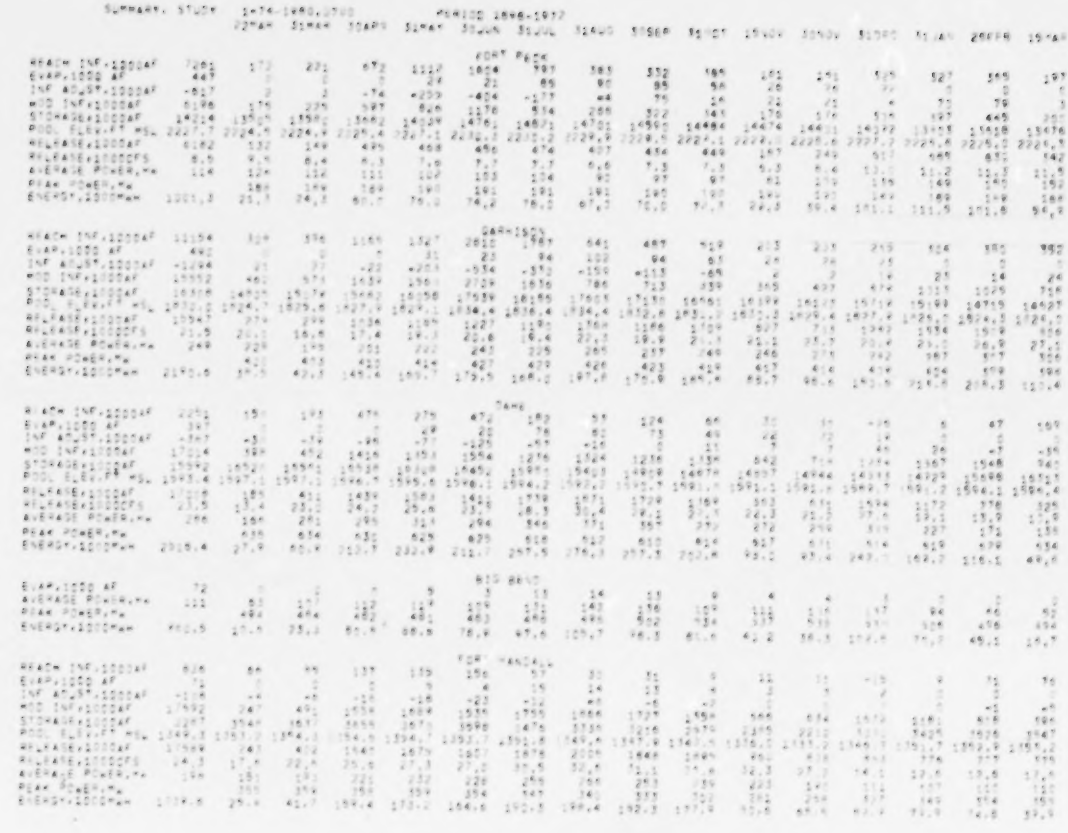


PLATE 3 33<

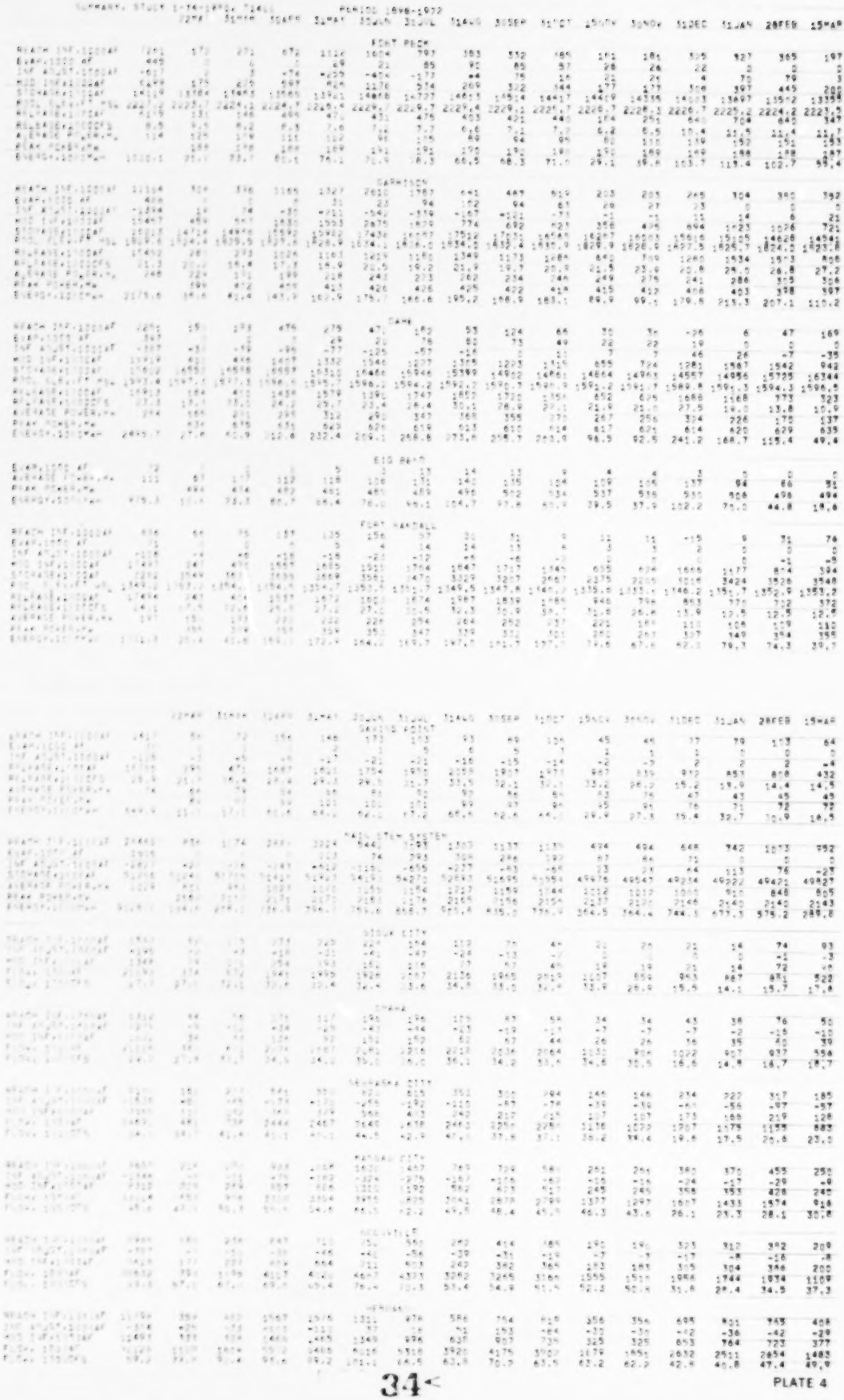


PLATE 4

SUMMARY, STAGE (-)24.1(1972), DISCHARGE IN 1000 CFS PERIOD 1898-1972

	28MAR	31MAY	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	30NOV	31DEC	31JAN	28FEB	15MAR
FORT PECK															
REACH INF,1000AF	7281	172	221	672	1112	1604	797	383	572	385	161	161	325	927	365	197
EVAP,1000 AF	445	0	0	0	29	21	85	90	85	57	28	26	22	0	0	0
INF ADJST,1000AF	-818	2	3	-76	-455	-906	-178	-4	75	16	66	22	4	70	79	3
MOD INF,1000AF	6197	174	225	597	828	1178	533	288	122	144	179	177	308	197	448	280
STORAGE,1000AF	14134	13426	13502	13603	13951	14707	14701	14601	14513	14396	14389	14319	13999	13719	13540	13395
POOL ELEVFT MSL	2227.3	2225.9	2224.3	2224.9	2226.6	2230.0	2230.0	2229.6	2229.1	2228.6	2228.5	2228.1	2226.8	2225.3	2224.4	2223.7
RELEASE,1000AF	6183	126	151	496	478	425	474	428	459	454	186	253	618	677	623	345
RELEASE,1000CFS	8.5	9.2	8.9	8.3	7.8	7.6	7.7	7.0	7.3	7.5	6.3	8.0	10.1	11.0	11.1	11.6
AVERAGE POWER,MW	114	122	113	111	104	97	105	94	98	98	81	111	195	147	147	193
PEAK POWER,MW		184	186	189	190	191	191	191	190	190	190	189	189	186	148	188
ENERGY,1000MWH	1001.3	22.6	24.6	80.5	77.8	70.2	78.7	70.5	69.8	73.4	29.9	40.5	100.8	109.6	100.3	55.1
GARRISON																
REACH INF,1000AF	11154	306	396	1185	1327	2610	1787	841	487	519	203	209	269	754	380	352
EVAP,1000 AF	466	0	0	0	31	23	94	101	93	62	28	27	22	0	0	0
INF ADJST,1000AF	-1588	17	22	-37	-220	-574	-391	-208	-140	-74	-3	-3	6	9	1	19
MOD INF,1000AF	15204	454	570	1624	1945	2837	1972	1150	686	838	361	425	867	992	1014	717
STORAGE,1000AF	16143	14711	14987	15561	15941	16356	16971	17384	16894	16455	16213	15952	15964	15656	14845	14536
POOL ELEVFT MSL	1829.5	1824.8	1826.6	1827.4	1828.6	1830.8	1830.3	1831.6	1830.0	1828.5	1829.6	1828.7	1827.4	1826.4	1824.0	1823.9
RELEASE,1000AF	15259	274	273	1049	1167	1222	1163	1347	1176	1277	802	886	1255	1500	1446	776
RELEASE,1000CFS	13.1	19.6	18.4	17.6	19.0	20.5	18.9	22.6	19.1	20.8	20.2	23.1	21.4	24.4	23.2	26.1
AVERAGE POWER,MW	248	225	181	264	219	243	221	293	241	254	256	267	237	281	298	296
PEAK POWER,MW		399	403	410	414	426	428	424	420	417	415	412	408	401	398	397
ENERGY,1000MWH	2149.8	37.9	41.4	147.5	161.5	175.8	164.8	194.1	169.2	183.8	89.2	98.3	176.8	209.1	212.6	106.6
OAHE																
REACH INF,1000AF	2251	153	193	479	279	472	182	93	124	66	31	30	-96	6	47	169
EVAP,1000 AF	394	0	0	0	29	20	78	79	73	49	22	22	19	0	0	0
INF ADJST,1000AF	-394	-29	-38	-74	-66	-111	-70	-38	-19	-7	6	6	45	26	-7	-33
MOD INF,1000AF	14722	394	448	1450	1349	1583	1197	1282	1200	1327	817	730	1255	1533	1015	912
STORAGE,1000AF	15426	14791	15316	15753	15136	15306	15796	15252	14774	14746	14659	14354	14757	15496	15088	
POOL ELEVFT MSL	1592.7	1586.2	1596.3	1596.2	1594.8	1595.6	1593.6	1591.6	1590.3	1590.4	1590.6	1589.1	1589.1	1589.8	1589.3	1588.9
RELEASE,1000AF	16705	181	457	1431	1573	1386	1759	1524	1685	1330	648	806	1691	1161	766	721
RELEASE,1000CFS	23.2	13.2	22.6	24.1	25.6	23.3	27.8	25.7	26.3	21.6	21.8	20.4	27.3	18.9	13.7	12.6
AVERAGE POWER,MW	280	161	276	293	310	288	319	361	347	284	284	287	324	246	168	135
PEAK POWER,MW		631	630	627	643	622	615	610	600	612	615	618	610	614	625	630
ENERGY,1000MWH	2460.9	27.4	40.1	220.6	230.7	207.7	262.8	269.3	258.3	196.9	95.5	89.6	239.4	167.1	114.0	48.8
BIG BEND																
EVAP,1000 AF	72	0	0	0	5	3	13	14	11	9	4	4	1	0	0	0
AVERAGE POWER,MW	109	82	105	111	118	107	120	130	123	107	107	107	124	93	65	51
PEAK POWER,MW		493	494	492	491	483	490	497	503	536	527	536	540	506	496	493
ENERGY,1000MWH	963.9	17.6	23.0	80.3	88.2	77.6	98.2	103.1	98.3	79.4	39.3	39.8	101.7	69.5	44.3	18.4
FORT RANDALL																
REACH INF,1000AF	876	66	95	137	135	156	85	30	31	9	11	11	-15	9	31	76
EVAP,1000 AF	73	0	0	0	5	4	14	14	11	8	3	3	2	0	0	0
INF ADJST,1000AF	-108	-4	-6	-15	-18	-23	-12	-8	-4	-2	1	1	2	0	-1	-5
MOD INF,1000AF	1352	245	447	1650	1678	1511	1726	1819	1681	1327	651	809	1858	1169	796	791
STORAGE,1000AF	3278	3155	3616	3655	3668	3594	3465	3316	3191	2945	2364	2201	3215	3424	3536	3540
POOL ELEVFT MSL	1349.1	1353.3	1354.3	1354.5	1354.7	1353.6	1351.6	1349.3	1347.5	1339.8	1339.6	1338.1	1346.2	1351.7	1352.9	1353.2
RELEASE,1000AF	17296	24	41	1631	1665	1586	1860	1961	1813	1860	932	771	844	761	694	768
RELEASE,1000CFS	23.9	17.4	22.5	25.7	27.1	26.7	30.3	31.9	30.5	30.3	31.3	25.9	13.7	12.4	12.4	12.4
AVERAGE POWER,MW	195	140	192	222	231	227	253	252	240	234	217	162	109	138	138	100
PEAK POWER,MW		355	359	358	359	353	346	338	331	307	270	267	326	149	154	155
ENERGY,1000MWH	1715.6	25.1	41.6	158.5	172.7	163.5	188.5	195.2	179.7	174.4	78.4	65.7	81.1	76.5	73.5	39.3

	28MAR	31MAY	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	30NOV	31DEC	31JAN	28FEB	15MAR
DEVILS POINT															
REACH INF,1000AF	1417	56	72	156	146	173	173	91	93	174	45	45	77	79	173	84
EVAP,1000 AF	32	0	0	0	2	1	5	6	5	3	1	1	1	0	0	0
INF ADJST,1000AF	-125	-3	-5	-7	-7	-14	-12	-16	-15	-14	-6	-7	-2	-2	-2	-4
MOD INF,1000AF	18558	293	466	1651	1755	1736	1916	2034	1961	1944	977	812	922	844	850	428
RELEASE,1000CFS	25.6	22.1	26.2	28.3	29.2	30.6	31.6	33.1	31.8	33.7	32.7	27.1	15.0	13.7	14.3	14.4
AVERAGE POWER,MW	73	64	76	83	85	86	90	91	91	95	92	77	47	53	48	48
PEAK POWER,MW		86	86	99	103	100	101	98	97	96	95	95	95	71	72	72
ENERGY,1000MWH	545.5	10.1	17.0	60.4	63.8	64.8	67.0	68.2	67.1	68.4	29.7	26.6	35.0	32.4	30.6	16.4
MAIN STEM SYSTEM															
REACH INF,1000AF	24465	836	1074	2886	3224	5442	3093	1705	1137	1135	494	494	648	742	1003	952
EVAP,1000 AF	1500	0	0	0	103	74	292	307	265	191	87	86	71	0	0	0
INF ADJST,1000AF	-2389	-58	-77	-220	-616	-1176	-722	-300	-119	-72	-20	-20	-58	-119	-71	-24
STORAGE,1000AF	51324	51039	49571	51024	51731	54261	54029	52615	51286	49787	49319	49074	48997	49178	49829	
AVERAGE POWER,MW	1019	769	901	1024	1072	1052	1139	1229	1147	1033	996	986	997	695	633	795
PEAK POWER,MW		2154	2154	2156	2167	2179	2173	2162	2152	2151	2131	2116	2142	2134	2115	2139
ENERGY,1000MWH	8936.7	137.6	207.6	737.5	790.1	786.4	849.6	900.2	826.0	768.4	358.7	355.2	734.5	664.1	566.3	284.8
SIOUX CITY															
REACH INF,1000AF	1543	80	119	273	229	226	164	102	75	48	20	20	21	14	74	93
INF ADJST,1000AF	-195	-7	-9	-28	-35	-61	-47	-26	-13	-5	2	2	7	2	-11	-3
MOD INF,1000AF	1348	74	111	256	193	165	116	77	61	43	19	19	28	16	62	90
FLOW, 1000AF	47715	3772	3710	5300	5708	5742	5912	5970	5896	5703	5632	5603	5643	5659	5873	5614
FLOW, 1000CFS	27.5	27.4	31.9	32.6	32.3	32.5	33.4	34.4	32.8	32.4	33.4	34.7	35.3	34.7	35.6	37.4
OMAHA															
REACH INF,1000AF	1312	44	56	171	117	178	156	105	67	58	34	34	43	38	76	50
INF ADJST,1000AF	-205	-6	-12	-24	-25	-43	-44	-21	-10	-11	-5	-7	-7	-7	-16	-10
MOD INF,1000AF	1032	34	43	130	92	150	152	82	67	64	28	28	35	31	60	39
FLOW, 1000AF	47899	3774	3698	5277	5681	5806	5971	6046	5976	5764	5660	5624	5651	5683	5917	5652
FLOW, 1000CFS	26.9	27.4	33.5	34.6	33.8	34.7	35.8	35.7	33.8	33.3	34.2	34.6	35.4	34.8	35.6	38.0
NEBRASKA CITY															
REACH INF,1000AF	5110	161	277	541	550	623	615	353	322	296	146	146	214	322	317	185
INF ADJST,1000AF	-1535	-50	-45	-173	-172	-255	-192	-110	-87	-78	-38	-39	-47	-56	-97	-57
MOD INF,1000AF	3565	110	142	368	378	368	423	243	235	218	107	107	167	265	219	128
FLOW, 1000AF	24454	479	775	2437	4401	2631	2623	2437	2203	2854	1126	996	1155	1764	1147	679
FLOW, 1000CFS	33.8	14.9	41.2	41.1	40.0	44.2	42.7	39.6	37.3	36.7	37.9	33.5	19.4	17.3	20.5	22.8
KANSAS CITY															
REACH INF,1000AF	3659	218	250	933	1708	1830	1467	769	729	580	251	261	381	371	455	250
INF ADJST,1000AF	-1346	-48	-51	-75	-152	-324	-275	-187	-155	-83	-36	-34	-47	-17	-29	-9
MOD INF,1000AF	8352	204	269	687	866	1305	1192	582	423	413	245	245	356	351	476	241
FLOW, 1000AF	51826	451	995	3283	5148	3939	3810	3519	2846	2774	1367	1272	1503	1405	1646	913
FLOW, 1000CFS	49.3	48.9	55.2	55.5	54.5	66.2	62.0	49.1	47.9	45.1	45.0	42.8	25.9	23.2	28.0	30.7
HODGEMAN															
REACH INF,1000AF	5965	185	278	847	712	752	580	282	414	385	170	194	323	712	372	209
INF ADJST,1000AF	-1357	-47	-55	-36	-46	-40	-56	-39	-31	-19	-7	-7	-17	-6	-16	-8
MOD INF,1000AF	5628	177	227	809	664	711	513	247	382	365	163	183	305	704	366	200
FLOW, 1000AF	56434	961	1192	4151	4013	4652	4308	3267	2205	3146	1542	1465	1940	1735	1926	1105
FLOW, 1000CFS	53.1	47.5	46.8	48.9	45.3	78.2	70.1	53.1	54.6	51.1	51.8	49.9	31.6	28.2	34.4	37.2
HERMANN															
REACH INF,1000AF	11728	359	462	1567	1576	1311	978	586	784	812	350	354	695	801	745	408
INF ADJST,1000AF	-1354	-45	-53	-150	-110	-44	18	91	183	-84	-37	-35	-42	-36	-42	-29
MOD INF,1000AF	11403	337	426	1466	1465	1349	996	638	967	735	326	343	764	723	737	377
FLOW, 1000AF	49928	1114	1511	5565	5479	6002	5322	3791	4144	3874	1801	1824	2615	2500	2648	1482
FLOW, 1000CFS	48.9	39.7	50.3	51.5	49.1	100.9	86.2	63.4	69.7	63.1	62.7	61.4	42.5	40.7	47.2	49.7

PLATE 5

SUMMARY STUDY 1-74-2000 PERIOD 1898-1972

	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	30NOV	31DEC	31JAN	28FEB	15MAR
FORT PECK															
BEGIN INF,1000AF	7281	172	221	472	1112	1424	799	381	332	385	191	181	329	127	365	197
EVAP,1000 AF	430	0	0	0	0	29	26	32	67	91	55	29	21	0	0	0
INF ADJST,1000AF	-798	1	1	-79	+276	-441	-227	-28	65	10	28	23	6	21	80	1
MID INF,1000AF	6274	173	223	595	807	1142	656	267	316	340	179	179	311	308	446	198
STORAGE,1000AF	13711	13694	13641	13177	13503	14213	14293	14147	14055	13981	13983	13981	13801	13945	13797	13860
POOL ELEV,FT MSL	2224.6	2223.8	2223.9	2224.2	2224.9	2225.9	2226.1	2226.0	2225.8	2225.7	2227.0	2227.9	2227.9	2228.0	2224.7	2224.1	2223.4
RELEASE,1000AF	6054	122	176	550	480	433	407	412	468	420	192	261	391	655	594	331
RELEASE,1000CFS	8.4	8.0	9.9	9.4	7.8	7.3	6.8	6.7	8.0	6.8	3.2	4.2	6.4	10.7	10.0	5.6
AVERAGE POWER,MW	111	117	172	126	105	99	88	88	91	85	87	85	115	129	142	141	147
PEAK POWER,MW		188	189	189	190	191	191	191	190	190	189	189	189	188	188	188	188
ENERGY,1000MWH	978.6	19.8	28.8	98.8	78.1	72.9	68.9	68.5	67.7	31.4	41.9	98.2	104.8	95.9	99.1	
GARRISON															
BEGIN INF,1000AF	11194	309	396	1165	1347	2610	1787	641	487	519	203	203	269	304	380	392
EVAP,1000 AF	445	0	0	0	30	22	90	97	89	59	28	26	21	0	0	0
INF ADJST,1000AF	-2232	20	32	-22	+109	-857	-496	-293	-216	-141	-19	-19	19	30	26	28
MID INF,1000AF	14439	488	620	1487	1447	2583	1617	882	690	719	356	418	872	998	1020	712
STORAGE,1000AF	15471	14917	14465	13684	13647	13851	17240	16809	17047	15920	15401	15159	14828	14374	13857	13929
POOL ELEV,FT MSL	1828.0	1824.1	1822.5	1819.9	1819.8	1830.5	1835.0	1832.7	1833.8	1829.4	1828.9	1827.9	1826.8	1826.0	1823.9	1823.4
RELEASE,1000AF	14699	285	298	1021	1110	1149	1227	1298	1147	1184	556	650	1211	1451	1417	740
RELEASE,1000CFS	20.3	15.1	14.5	17.7	18.2	18.7	20.0	21.1	19.3	19.3	9.0	10.6	19.7	23.6	23.8	12.4
AVERAGE POWER,MW	246	227	175	219	222	232	245	256	234	234	109	128	237	279	279	146
PEAK POWER,MW		419	422	429	429	434	434	431	429	424	424	424	424	420	418	418	418
ENERGY,1000MWH	2158.5	36.1	37.8	140.4	154.0	172.3	179.7	190.9	172.0	174.5	82.0	95.6	176.0	216.9	204.1	106.2	
OAHE															
BEGIN INF,1000AF	2201	150	143	476	279	472	182	93	124	86	30	30	-26	6	47	169
EVAP,1000 AF	372	0	0	0	27	19	73	74	69	44	21	21	18	0	0	0
INF ADJST,1000AF	-1001	-20	-10	-131	-179	-228	-225	-73	+122	-29	0	0	47	27	-7	-33
MID INF,1000AF	15978	386	413	1164	1189	1374	1110	1202	1082	1027	573	669	1214	1485	1457	876
STORAGE,1000AF	24704	25707	24722	25213	25444	25490	24925	24834	25017	25001	25019	24865	23751	24169	24929	25499
POOL ELEV,FT MSL	1596.9	1596.9	1596.9	1596.9	1596.4	1596.5	1596.2	1596.2	1596.2	1596.1	1596.3	1596.0	1595.6	1596.0	1596.0	1596.1	1596.1
RELEASE,1000AF	15969	172	391	1384	1469	1528	1695	1674	1597	1190	942	838	1527	1267	721	902	
RELEASE,1000CFS	21.9	12.4	22.3	21.2	23.8	22.3	27.6	27.2	26.8	19.4	15.2	14.1	24.8	17.4	12.5	10.2	
AVERAGE POWER,MW	280	193	270	278	291	272	324	333	326	234	222	210	294	251	193	127	
PEAK POWER,MW		631	631	627	626	621	613	609	603	607	611	614	607	614	624	630	
ENERGY,1000MWH	2284.0	25.9	58.9	206.9	216.7	196.3	240.9	248.0	234.8	174.4	80.0	79.2	216.9	155.3	104.2	45.9	
BIG BEND															
EVAP,1000 AF	67	0	0	0	4	3	12	13	12	8	4	4	3	0	0	0
AVERAGE POWER,MW	102	94	103	106	110	103	128	127	126	95	91	95	124	85	59	68
PEAK POWER,MW		491	491	486	484	486	485	500	502	533	535	537	530	505	496	492
ENERGY,1000MWH	897.5	9.8	22.4	78.8	82.1	76.8	95.5	94.7	90.6	70.8	32.9	32.7	92.5	63.9	43.6	17.4
FORT RANDALL															
BEGIN INF,1000AF	836	60	85	137	139	156	97	30	31	9	11	11	-15	9	31	76
EVAP,1000 AF	62	0	0	0	5	3	12	12	11	7	3	3	2	0	0	0
INF ADJST,1000AF	-134	-4	-9	-19	-24	-31	-21	-10	-8	-1	0	0	0	0	0	-9
MID INF,1000AF	10141	236	471	1484	1586	1444	1755	1668	1598	1182	948	942	1557	1276	732	373
STORAGE,1000AF	3019	3209	3401	3415	3450	3270	3142	2991	2801	2444	2202	2006	2016	3191	3272	3506
POOL ELEV,FT MSL	1349.7	1353.6	1354.7	1354.8	1355.9	1352.4	1351.3	1348.3	1345.9	1339.5	1338.7	1333.4	1346.4	1351.9	1353.0	1353.6	
RELEASE,1000AF	10138	226	385	1472	1631	1537	1820	1619	1716	1245	792	677	756	701	651	339	
RELEASE,1000CFS	22.3	14.5	21.6	24.7	26.5	25.8	29.6	29.8	28.7	26.1	26.8	24.8	12.3	11.4	11.6	11.4	
AVERAGE POWER,MW	192	149	193	221	230	227	256	255	249	221	207	175	103	101	101	105	
PEAK POWER,MW		367	368	368	365	358	351	345	336	328	371	290	348	367	367	367	
ENERGY,1000MWH	1890.8	25.0	41.9	159.3	174.0	169.2	190.8	190.3	178.5	164.7	74.9	63.2	77.3	76.8	72.4	37.8	

	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	30NOV	31DEC	31JAN	28FEB	15MAR
GAVINS POINT															
BEGIN INF,1000AF	1617	54	72	154	148	172	103	99	106	49	45	77	79	178	84
EVAP,1000 AF	24	0	0	0	1	1	5	6	5	3	1	1	1	0	0	0
INF ADJST,1000AF	-149	-7	-9	-7	-22	-26	-28	-19	-14	-8	-2	-2	-2	-2	-2	-8
RELEASE,1000AF	17380	281	452	1622	1793	1681	1889	1960	1773	1703	833	716	837	784	758	398
RELEASE,1000CFS	24.0	21.7	29.3	27.9	29.6	28.1	30.7	32.7	28.8	27.7	28.0	24.2	13.6	13.8	13.5	13.4
AVERAGE POWER,MW	78	76	87	92	96	94	96	93	88	82	78	74	91	89	91	91	
PEAK POWER,MW		107	108	111	112	107	111	111	109	104	108	107	89	88	87	87	
ENERGY,1000MWH	664.8	12.9	16.9	68.8	71.6	67.8	72.1	67.3	63.7	61.1	28.4	28.8	38.5	34.3	33.0	18.4	
MAIN STEM SYSTEM															
BEGIN INF,1000AF	24485	836	1074	2881	3224	5442	3393	1729	1137	1135	494	496	848	742	1023	992
EVAP,1000 AF	1424	0	0	0	98	72	277	291	270	181	82	82	68	0	0	0
INF ADJST,1000AF	-4272	-22	-16	-725	-847	-1440	-1249	-488	-1048	-158	14	14	184	149	178	-414
STORAGE,1000AF	49814	48186	48066	49366	49703	51787	51847	50148	47844	47954	47470	47152	46966	47648	47320	47768
AVERAGE RELEASE,KAF	951	787	943	1032	1088	1033	1142	1158	1115	981	914	941	940	869	814	774
PEAK POWER,MW		2205	2270	2274	2205	2207	2195	2188	2172	2201	2173	2161	2149	2183	2191	2183
ENERGY,1000MWH	8691.8	131.7	208.2	749.9	787.8	744.1	848.8	802.2	803.4	719.4	329.1	339.8	890.4	847.2	782.2	778.9
SIOUX CITY															
BEGIN INF,1000AF	1543	82	105	273	249	224	104	72	44	22	20	21	14	74	93	
INF ADJST,1000AF	-158	-5	-5	-18	-42	-56	-58	-22	-9	0	0	0	12	7	-2	
MID INF,1000AF	1385	77	100	255	206	168	46	50	35	22	20	21	26	81	91	
FLOW, 1000AF	18748	781	1054	1877	1942	1846	1808	1980	1830	1701	859	744	872	859	828	492
FLOW, 1000CFS	25.6	26.1	35.2	31.5	31.8	30.1	32.8	32.2	30.9	28.6	28.9	25.6	14.2	15.2	14.7	10.5	
OMAHA															
BEGIN INF,1000AF	1312	44	56	174	157	196	198	105	87	58	34	34	63	39	78	95
INF ADJST,1000AF	-612	-11	-14	-38	-62	-90	-142	+110	-69	-12	-7	-9	-4	-3	-18	-12
MID INF,1000AF	699	33	42	133	94	106	56	-12	18	46	28	26	59	36	60	39
FLOW, 1000AF	19449	766	583	2005	1997	1994	2048	1956	1861	1814	884	780	934	847	879	523
FLOW, 1000CFS	28.8	26.4	42.7	37.7	32.9	32.8	33.3	31.9	31.3	29.5	29.9	25.4	15.2	15.9	15.7	17.0
NEBRASKA CITY															
BEGIN INF,1000AF	5120	181	207	541	551	823	619	393	300	294	146	149	274	322	317	185
INF ADJST,1000AF	-1892	-55	-71	-188	-224	-307	-267	-197	-173	-98	-47	-47	-47	-37	-171	-87
MID INF,1000AF	3240	105	119	353	346	516	347	196	127	196	98	98	171	185	215	122
FLOW, 1000AF	22848	882	754	2798	2846	2471	2399	2190	2054	2092	982	890	1119	1218	1259	699
FLOW, 1000CFS	31.3	33.1	41.0	39.6	39.1	41.9	39.0	35.0	34.3	32.7	33.0	30.1	18.1	19.5	19.9	21.7
KANSAS CITY															
BEGIN INF,1000AF	9859	318	280	933	1068	1630	1447	799	720	984	281	284	384	370	699	280
INF ADJST,1000AF	-2098	-24	-31	-187	-262	-432	-447	-309	-231	-128	-47	-47	-58	-44	-37	-27
MID INF,1000AF	7371	194	249	798	829	1197	1000	459	499	451	214	214	322	323	399	228
FLOW, 1000AF	35065	1418	961	3151	3149	3671	3413	2858	2542	2474	1193	1131	1647	1744	1445	850
FLOW, 1000CFS	47.5	44.6	52.1	53.0	51.2	51.7	49.5	42.4	42.7	40.2	40.1	36.1	23.9	21.9	26.5	28.9
BOONVILLE															
BEGIN INF,1000AF	5965	184	216	647	710	752	581	262	414	385	192	191	323	312	362	259
INF ADJST,1000AF	-689	-14	-18	-61	-78	-86	-107	-76	-69	-53	-17	-17	-19	-28	-39	-29
MID INF,1000AF	5295	171	198	586	632	681	453	225	354	332	173	174	283	286	347	191
FLOW, 1000AF	35761	751	1143	3939	3761	4356	3864	2822	2952	2917	1364	1334	1748	1828	1746	1746
FLOW, 1000CFS	48.8	54.1	64.0	66.2	61.9	70.2	62.9	45.7	48.8	47.8	45.9	44.8	29.1	28.6	32.6	35.2
HERMANN															
BEGIN INF,1000AF	11799	359	462	1567	1576	1311	976	984	754	819	350	356	695	801	799	433
INF ADJST,1000AF	-555	-27	-75	-215	-132	-54	-55	-5	130	-93	-34	-34	-48	-42	-48	-31
MID INF,1000AF	11276	371	426	1491	1447	1326	977	881	884	727	322	322	647	799	758	372
FLOW, 1000AF	46597	1063	1559	5369	5224	5681	4707	3393	3749	3549	1655	1656	2452	2599	2540	1415
FLOW, 1000CFS	64.3	74.4	87.4	91.6	85.0	95.5	77.9	55.2	63.7	57.7	56.7	56.5	39.9	39.5	45.3	47.6

PLATE 6

SUMMARY STUDY 1-74-2105, STOR PERIOD 1948-1972

	31MAR	31MAY	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	30NOV	30NOV	31DEC	31JAN	28FEB	31MAR
FORT PECK															
REACH INF.1000AF	7261	172	221	672	1112	1654	797	193	332	785	154	184	329	327	345	197
EVAP.1000 AF	429	0	0	0	0	20	82	86	82	54	25	25	21	0	0	0
INF ADJST.1000AF	-749	3	4	-76	-276	-441	-227	-29	55	12	43	23	6	71	82	5
MID INF.1000AF	6083	174	225	596	847	1193	487	257	316	844	172	170	314	398	446	200
STORAGE.1000AF	15723	15321	15145	15172	15534	14.6L	14215	14113	14256	13979	13953	13874	13958	13754	13244	13068
POOL ELEV.FT MSL	2226.6	2225.8	2224.1	2224.7	2225.8	2227.1	2226.2	2226.6	2226.2	2225.9	2225.7	2225.7	2225.7	2226.1	2224.9	2224.2	2223.6
RELEASE.1000AF	8262	183	191	476	804	464	476	387	349	411	203	256	587	642	599	322	322
RELEASE.1000CFS	8.4	8.9	10.4	8.7	7.9	7.8	7.1	6.3	6.5	6.7	5.9	6.7	9.6	10.5	10.9	10.4	10.8
AVERAGE POWER,MW	171	157	155	150	149	149	96	91	86	87	99	114	135	139	140	141	141
PEAK POWER,MW	186	184	184	190	191	192	192	191	191	190	190	190	190	190	190	190	189
ENERGY.1000MWH	123.2	134.8	29.4	93.7	78.8	74.3	71.9	62.4	62.2	65.2	72.1	81.2	95.5	103.9	99.0	91.7
GARRISON															
REACH INF.1000AF	11154	108	378	1165	1527	2412	1787	541	487	519	253	201	249	304	380	382
EVAP.1000 AF	463	0	0	0	0	30	22	90	97	69	54	28	26	21	0	0	0
INF ADJST.1000AF	-2972	12	13	-117	-354	-704	-531	-536	-261	-196	-42	-43	-9	-8	-18	-8	13
MID INF.1000AF	8191	441	593	1624	1427	3058	1601	592	526	665	335	393	831	939	980	1000	689
STORAGE.1000AF	15512	13924	14254	14942	15350	15764	17200	16579	15976	15590	15334	15110	14725	14238	13643	13276	
POOL ELEV.FT MSL	1928.8	1923.4	1924.6	1927.1	1928.7	1931.7	18.4.8	1934.6	1930.6	1928.5	1927.1	1926.3	1924.5	1922.8	1922.8	1922.8	
RELEASE.1000AF	14171	765	243	994	969	1132	1110	1277	1127	1154	514	617	1219	1422	1385	931	
RELEASE.1000CFS	19.8	19.0	14.2	16.7	15.8	19.0	18.1	20.7	18.9	19.4	17.3	20.8	19.7	23.1	24.7	24.6	
AVERAGE POWER,MW	230	226	178	241	192	235	234	259	235	236	225	253	258	277	283	280	
PEAK POWER,MW		450	422	427	431	437	436	432	430	428	428	427	424	420	416	415	
ENERGY.1000MWH	2049.7	167.1	38.5	140.2	143.3	169.1	166.9	192.8	169.6	171.5	76.2	92.9	177.8	206.4	199.1	134.6	
OAHE																	
REACH INF.1000AF	2251	151	193	479	279	472	152	53	124	64	30	30	-26	6	47	167	
EVAP.1000 AF	352	0	0	0	48	52	72	70	66	49	32	20	17	0	0	0	
INF ADJST.1000AF	-1001	-20	-58	-135	-179	-205	-229	-73	-122	-29	9	8	27	27	-7	-33	
MID INF.1000AF	3108	186	418	1138	1043	1594	997	1181	1163	1144	574	619	1213	1456	1429	1467	
STORAGE.1000AF	13842	14477	14913	14931	14593	14426	13990	13629	13239	13135	13053	13176	13319	13532	13666	13666	
POOL ELEV.FT MSL	1597.2	1591.7	1591.6	1591.4	1589.7	1589.9	1587.3	1585.7	1583.9	1584.1	1584.6	1585.4	1585.7	1586.4	1586.6	1586.6	
RELEASE.1000AF	15062	167	392	1721	1419	1281	1612	1543	1551	1151	519	514	1481	1533	1576	787	
RELEASE.1000CFS	20.6	17.1	22.1	28.0	23.1	21.6	26.2	26.1	26.1	18.7	17.5	17.1	24.1	26.8	25.6	9.5	
AVERAGE POWER,MW	245	146	261	261	279	258	313	319	310	222	227	227	275	295	285	117	
PEAK POWER,MW		411	610	457	599	599	588	584	578	582	585	584	582	590	612	609	
ENERGY.1000MWH	2251.2	24.6	56.2	184.5	209.1	190.1	233.4	237.9	223.2	165.7	74.8	74.6	204.8	199.2	98.9	42.5	
BIG BEND																	
EVAP.1000 AF	87	0	0	0	4	3	12	13	12	9	4	4	3	0	0	0	
AVERAGE POWER,MW	98	57	102	101	107	100	124	129	122	97	88	86	120	83	57	45	
PEAK POWER,MW		493	491	490	484	486	493	500	502	502	535	536	511	505	496	495	
ENERGY.1000MWH	859.2	41.6	72.2	73.4	79.7	74.4	92.3	95.1	88.3	68.6	65.4	64.2	89.7	61.9	39.2	26.5	
FORT RANDALL																	
REACH INF.1000AF	836	56	65	137	135	65	57	30	31	9	11	11	-15	9	11	76	
EVAP.1000 AF	63	0	0	0	9	5	12	13	11	7	5	5	2	0	0	0	
INF ADJST.1000AF	-174	-4	-5	-19	-24	-31	-21	-10	-8	-1	0	0	0	0	0	-2	
MID INF.1000AF	2003	229	473	1429	1261	1424	1443	1437	1552	1140	539	536	1447	1443	1411	1194	
STORAGE.1000AF	1522	1299	1671	1629	1553	1.60	1531	1500	1843	2454	2210	2054	2851	3177	1248	1276	
POOL ELEV.FT MSL	1348.7	1343.3	1356.7	1356.4	1351.9	1352.0	1351.4	1344.1	1346.0	1334.5	1339.6	1333.6	1346.4	1351.7	1352.9	1353.1	
RELEASE.1000AF	15635	322	371	1421	1578	1486	1766	1771	1869	1572	764	647	710	677	616	527	
RELEASE.1000CFS	21.6	16.1	20.8	23.9	25.7	24.2	28.7	29.9	28.1	25.5	23.7	21.8	11.5	11.0	11.5	11.5	
AVERAGE POWER,MW	187	145	196	213	229	220	249	251	239	224	211	188	119	99	111	101	
PEAK POWER,MW		357	358	358	365	359	353	349	336	334	332	330	346	347	347	347	
ENERGY.1000MWH	1845.3	24.4	40.3	153.9	170.5	164.1	185.4	186.4	172.4	168.7	72.4	69.8	74.6	74.2	68.6	35.6	

	31MAR	31MAY	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	30NOV	30NOV	31DEC	31JAN	28FEB	31MAR
GAVINS POINT															
REACH INF.1000AF	1417	56	72	154	148	473	103	93	69	104	49	46	77	79	173	64
EVAP.1000 AF	26	0	0	0	1	1	5	5	5	3	1	1	1	0	0	0
INF ADJST.1000AF	-149	-3	-5	-7	-22	-26	-78	-12	-15	-14	-2	-2	2	2	2	-4
RELEASE.1000AF	16811	376	436	1576	1724	1431	1836	1848	1737	1468	814	684	866	759	722	386
RELEASE.1000CFS	23.3	19.5	24.6	26.4	27.7	27.4	29.9	30.1	29.2	27.1	27.0	23.1	13.9	14.4	12.9	17.1
AVERAGE POWER,MW	76	74	79	81	83	82	95	93	87	81	77	79	47	47	49	49
PEAK POWER,MW		99	107	105	102	101	101	102	109	109	109	109	101	85	96	86
ENERGY.1000MWH	672.9	27.6	29.8	83.6	89.4	88.5	72.1	67.1	63.3	60.7	28.2	29.1	37.1	34.1	33.4	17.9
MISSOURI SYSTEM STORAGE															
REACH INF.1000AF	24465	616	1074	2401	3224	4242	1593	1198	1137	1135	494	494	644	742	1013	952
EVAP.1000 AF	1411	0	0	0	97	67	271	284	266	174	95	87	67	0	0	0
INF ADJST.1000AF	-4765	-23	-70	-371	-882	-1491	-1794	-493	-549	-251	-47	-7	59	156	43	-27
STORAGE.1000AF	41917	47195	47697	46953	48727	50111	50594	49191	47955	46948	46522	46211	46004	46471	44333	46780
AVERAGE POWER,MW	959	768	949	1003	1005	1003	1121	1120	1096	953	874	910	910	1007	737	747
PEAK POWER,MW		2179	2179	2184	2181	2182	2174	2156	2148	2148	2148	2147	2142	2165	2158	2127
ENERGY.1000MWH	8411.8	529.1	655.1	1121.2	748.4	779.5	825.1	839.5	778.8	692.4	314.6	324.4	679.1	626.9	514.2	760.1
SIOUX CITY															
REACH INF.1000AF	1543	82	119	211	269	624	164	102	70	49	22	21	21	14	74	91
INF ADJST.1000AF	-158	-1	-2	-19	-40	-54	-58	-22	-5	9	3	1	12	15	7	-1
MID INF.1000AF	1385	81	117	254	184	188	105	79	65	57	25	22	33	29	81	90
FLOW.1000AF	15254	755	542	1621	1659	1796	1841	1924	1802	1714	811	714	847	788	803	478
FLOW.1000CFS	25.2	25.6	20.4	26.4	26.7	29.2	29.9	32.4	30.3	27.9	27.9	24.1	13.8	14.3	13.1	
OMAHA															
REACH INF.1000AF	1312	44	56	171	117	190	198	105	87	55	24	36	45	38	76	52
INF ADJST.1000AF	-622	-11	-14	-18	-60	-90	-142	-118	-63	-12	-7	-7	-4	-3	-18	-19
MID INF.1000AF	699	33	42	152	56	100	56	-13	18	43	18	29	41	34	58	33
FLOW.1000AF	16954	750	570	1753	1745	1830	1895	1813	1824	1771	856	752	915	823	843	511
FLOW.1000CFS	26.2	25.9	21.4	28.5	29.3	29.8	32.4	31.1	30.7	28.4	28.3	25.6	14.7	14.4	13.7	17.7
NEBRASKA CITY															
REACH I.1000AF	5120	181	217	941	953	423	615	551	355	294	145	146	214	227	317	185
INF ADJST.1000AF	-1852	-46	-71	-148	-204	-407	-267	-137	-123	-98	-47	-47	-62	-57	-171	-61
MID INF.1000AF	3268	135	119	351	146	416	347	196	177	196	98	98	171	165	215	127
FLOW.1000AF	22222	456	711	2174	2231	2432	2142	2109	2003	1760	954	864	1144	989	1171	632
FLOW.1000CFS	33.6	32.9	26.3	35.4	37.5	39.5	36.1	34.3	33.7	32.0	32.1	29.1	17.6	16.1	19.1	21.3
KANSAS CITY															
REACH INF.1000AF	9959	258	280	933	1366	1934	1467	769	729	584	251	264	341	374	655	296
INF ADJST.1000AF	-2288	-64	-71	-137	-260	-432	-447	-303	-231	-129	-47	-47	-54	-44	-57	-27
MID INF.1000AF	7371	174	249	796	805	1497	1020	439	497	455	214	214	312	325	598	273
FLOW.1000AF	29573	512	912	3157	3097	3423	3361	2565	2506	2431	1165	1101	1419	1519	1463	843
FLOW.1000CFS	43.6	44.1	32.2	51.1	50.4	51.9	54.7	41.7	42.1	39.5	39.3	37.1	23.6	24.9	23.8	28.5
WAVERLY															
REACH INF.1000AF	3485	185	278	847	742	78	545	282	414	364	193	194	325	332	382	269
INF ADJST.1000AF	-849	-16	-18	-65	-78	-62	-107	-76	-59	-51	-17	-17	-19	-26	-35	-15
MID INF.1000AF	5295	171	219	785	632	483	453	205	354	331	175	174	285	306	347	197
FLOW.1000AF	34869	746	1113	3677	3729	4308	3812	2758	2866	2771	1341	1300	1764	1809	1814	1035
FLOW.1000CFS	48.1	51.7	63.5	65.8	60.7	72.4	62.0	45.0	48.2	45.1	45.3	42.7	28.5	29.5	29.2	34.8
HERMANN															
REACH INF.1000AF	11795	159	452	1567	1576	1411	978	598	754	419	336	354	494	451	769	493
INF ADJST.1000AF	-558	-27	-15	-119	-132	14	-55	-5	130	-90	-34	-34	-44	-42	-48	-31
MOD INF.1000AF	12236	351	436	1448	1444	1425	923	593	884	329	302	320	450	409	721	462
FLOW.1000AF	46106	1758	1550	5358	5173	5434	4734	3349	3753	3509	1662	1615	2417	2177	2518	1403
FLOW.1000CFS	63.6	74.1	86.9	89.7	84.1	94.7	77.0	56.5	63.1	57.1	55.9	52.1	39.1	39.6	44.9	47.2

PLATE 7

SUMMARY, STUDY 1-74-2000,01400 PERIOD 1898-1972

	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	30NOV	31DEC	31JAN	28FEB	15MAR
FORT PECK															
REACH INF,1000AF	7281	172	221	672	1112	1424	707	383	332	385	181	181	325	327	385	197
EVAP,1000 AF	422	0	0	0	0	28	20	81	85	58	25	25	20	0	0	0
INF ADJST,1000AF	-749	3	4	-76	-276	-441	-227	-29	65	19	23	23	6	71	82	3
MOD INF,1000AF	6089	175	225	445	807	1142	488	269	317	350	179	179	311	398	446	200
STORAGE,1000AF	13440	12894	12934	12930	13227	13897	13935	13813	13769	13708	13689	13614	13356	13116	12950	12861
POOL ELE,FT MSL	2225.4	2222.7	2223.0	2223.0	2224.5	2227.9	2228.0	2227.3	2227.0	2226.7	2226.6	2226.2	2225.0	2223.8	2223.1	2222.5
RELEASE,1000AF	6068	121	186	599	510	472	496	391	361	411	197	254	570	638	581	319
RELEASE,1000CFS	8.4	8.8	10.4	10.1	8.3	7.9	7.3	6.4	6.1	6.7	6.7	8.6	9.3	10.4	10.4	10.7
AVERAGE POWER,MW	111	116	138	133	110	107	98	84	80	87	86	112	124	138	137	141
PEAK POWER,MW		180	189	189	190	192	191	191	190	190	190	189	189	189	189	188
ENERGY,1000MWH	975.8	19.5	30.0	96.3	82.1	77.1	73.5	62.8	58.1	65.0	31.3	40.7	92.4	109.8	93.2	50.9
GARRISON															
REACH INF,1000AF	11154	308	396	1165	1327	2810	1787	641	487	519	203	203	248	304	380	382
EVAP,1000 AF	494	0	0	0	29	21	88	95	87	58	26	25	21	0	0	0
INF ADJST,1000AF	-3112	0	0	-162	-399	-747	-576	-383	-306	-231	-64	-64	-64	-63	-63	-61
MOD INF,1000AF	13656	420	581	1607	1408	2514	1572	553	454	441	310	368	749	890	898	670
STORAGE,1000AF	14969	13460	13795	14404	14902	16320	16886	16246	15654	15200	14994	14744	14320	13814	13348	13300
POOL ELEV,FT MSL	1827.1	1821.7	1823.0	1825.3	1827.1	1832.2	1833.8	1831.6	1829.5	1828.0	1827.3	1826.4	1824.8	1822.9	1821.1	1821.0
RELEASE,1000AF	13647	260	256	983	910	1096	1006	1893	1046	1094	517	617	1183	1397	1383	719
RELEASE,1000CFS	18.8	18.8	14.4	16.5	14.8	18.4	16.4	19.4	17.6	17.8	17.4	20.8	19.3	22.7	24.3	24.2
AVERAGE POWER,MW	227	220	172	197	179	227	202	202	217	217	211	256	231	270	286	283
PEAK POWER,MW		412	416	422	426	436	435	432	429	427	426	424	420	415	410	410
ENERGY,1000MWH	1998.3	37.1	37.2	141.9	133.2	163.5	150.5	150.2	156.5	162.1	76.2	90.3	172.5	201.1	194.1	101.9
OAHE															
REACH INF,1000AF	2251	130	193	479	275	472	182	51	124	88	38	38	-26	8	47	169
EVAP,1000 AF	358	0	0	0	26	16	71	71	68	44	20	20	17	0	0	0
INF ADJST,1000AF	-1001	-29	-38	-131	-179	-226	-225	-73	-122	-29	0	0	47	27	-7	-33
MOD INF,1000AF	14539	381	411	1328	983	1322	891	1107	981	1006	537	636	1187	1431	1403	854
STORAGE,1000AF	14026	15075	15100	15132	14743	14834	14143	13671	13168	13195	13240	13328	13426	13543	14286	14866
POOL ELEV,FT MSL	1588.7	1593.0	1593.0	1592.8	1591.2	1591.9	1588.6	1587.1	1585.2	1585.4	1586.0	1586.9	1588.3	1586.9	1590.0	1592.2
RELEASE,1000AF	14531	164	386	1298	1372	1932	1582	1572	1485	1069	482	494	1443	1014	660	274
RELEASE,1000CFS	20.1	11.8	21.6	21.8	22.3	28.7	25.7	25.6	25.0	17.4	16.2	16.4	23.5	16.5	11.8	9.2
AVERAGE POWER,MW	239	143	257	260	269	350	306	307	298	208	195	196	271	193	142	114
PEAK POWER,MW		519	518	514	508	509	507	502	506	489	509	507	501	498	510	517
ENERGY,1000MWH	2100.7	24.2	55.6	187.4	200.2	180.2	228.3	228.9	215.0	155.0	70.4	71.9	201.7	143.7	96.9	41.2
BIG BEND															
EVAP,1000 AF	67	0	0	0	4	3	12	13	12	8	4	4	3	0	0	0
AVERAGE POWER,MW	95	56	100	100	103	96	120	119	117	85	81	85	117	81	58	44
PEAK POWER,MW		493	482	480	486	487	494	501	502	533	536	532	506	506	498	493
ENERGY,1000MWH	839.2	9.4	21.8	72.6	77.2	69.5	89.6	89.2	84.4	63.8	29.3	30.0	87.4	60.8	38.3	15.8
FORT RANDALL															
REACH INF,1000AF	836	66	85	137	135	156	57	30	31	9	11	11	-15	9	31	78
EVAP,1000 AF	62	0	0	0	5	3	12	12	11	7	3	3	2	0	0	0
INF ADJST,1000AF	-134	-4	-5	-19	-24	-33	-21	-10	-8	-1	0	0	0	0	0	-9
MOD INF,1000AF	15103	226	466	1414	1473	1348	1593	1546	1484	1061	485	498	1422	1023	691	348
STORAGE,1000AF	2999	3290	3398	3487	3326	3220	3273	2925	2893	2435	2204	2089	2812	3177	3288	3296
POOL ELEV,FT MSL	1348.4	1353.3	1354.6	1354.8	1353.8	1351.9	1349.2	1346.7	1345.4	1339.2	1335.7	1333.8	1346.4	1351.7	1352.9	1353.3
RELEASE,1000AF	15100	219	368	1403	1554	1445	1749	1714	1556	1496	717	617	695	658	600	320
RELEASE,1000CFS	20.8	15.8	20.6	23.6	25.3	24.3	28.5	27.9	26.2	24.1	24.1	20.7	11.3	10.7	10.7	10.8
AVERAGE POWER,MW	180	142	185	211	225	214	245	240	223	204	170	161	95	87	78	59
PEAK POWER,MW		367	367	368	364	356	348	338	333	314	301	291	348	367	367	367
ENERGY,1000MWH	1565.6	24.0	40.0	152.1	167.6	154.1	182.4	178.7	161.2	151.9	68.8	58.3	71.3	72.3	67.0	35.8

	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	30NOV	31DEC	31JAN	28FEB	15MAR
GAVINS POINT															
REACH INF,1000AF	1417	56	72	156	148	173	103	93	89	106	45	45	77	79	103	64
EVAP,1000 AF	26	0	0	0	1	1	5	5	5	3	1	1	1	0	0	0
INF ADJST,1000AF	-149	-3	-5	-7	-22	-28	-28	-10	-16	-14	-2	-2	-2	-2	-2	-4
RELEASE,1000AF	16342	271	435	1553	1679	1589	1819	1783	1623	1567	798	658	774	741	776	379
RELEASE,1000CFS	22.6	19.5	24.4	26.1	27.3	26.7	29.6	29.0	27.3	25.5	25.5	22.1	12.6	12.1	12.6	12.8
AVERAGE POWER,MW	79	74	90	92	92	91	99	98	93	94	94	70	47	45	48	48
PEAK POWER,MW		98	106	110	111	111	111	109	106	105	104	100	87	85	86	86
ENERGY,1000MWH	658.5	12.5	18.4	65.1	68.9	66.1	72.8	65.8	69.2	58.4	26.9	25.5	35.6	34.2	32.6	17.6
MAIN SYSTEM															
REACH INF,1000AF	24465	838	1076	2880	3264	5148	3269	1361	1117	1135	476	484	948	742	1003	952
EVAP,1000 AF	1387	0	0	0	87	69	277	277	244	177	80	80	66	0	0	0
INF ADJST,1000AF	-5305	-37	-47	-416	-937	-1535	-1139	-538	-394	-244	-70	-70	14	59	18	-42
STORAGE,1000AF	47403	46697	47149	47842	48169	50249	50006	48624	47413	46499	46096	45795	45583	45619	45852	46291
AVERAGE POWER,MW	930	783	939	993	980	684	1068	1082	1021	882	840	879	888	826	770	731
PEAK POWER,MW		2179	2180	2186	2188	2191	2178	2167	2148	2163	2153	2141	2140	2163	2160	2164
ENERGY,1000MWH	8158.0	126.6	203.0	715.6	729.3	710.5	795.1	805.6	735.5	656.3	302.7	316.7	661.0	614.8	522.1	263.3
SIOUX CITY															
REACH INF,1000AF	1543	82	105	273	225	224	164	102	78	48	20	20	21	14	74	93
INF ADJST,1000AF	-158	-1	-1	-19	-40	-58	-58	-22	-9	0	0	0	12	10	7	-1
MOD INF,1000AF	1385	80	103	254	184	166	105	79	69	48	20	20	33	24	81	92
FLOW, 1000AF	17720	352	536	1806	1864	1757	1924	1863	1689	1615	784	684	808	766	787	471
FLOW, 1000CFS	24.8	25.4	30.2	30.3	30.3	29.5	31.3	30.3	28.4	26.4	26.4	23.0	13.1	13.5	14.1	15.9
OMAHA															
REACH INF,1000AF	1312	44	56	171	117	196	-196	105	87	58	34	34	43	38	76	30
INF ADJST,1000AF	-612	-11	-14	-38	-80	-90	-142	-118	-69	-12	-7	-7	-4	-3	-18	-12
MOD INF,1000AF	699	33	42	132	36	105	54	-12	18	45	26	26	38	35	58	18
FLOW, 1000AF	18419	356	567	1933	1920	1885	1976	1852	1714	1675	809	728	868	804	840	504
FLOW, 1000CFS	25.4	25.7	31.8	32.5	31.2	31.4	32.1	30.1	28.8	27.3	27.2	24.5	14.1	13.1	15.0	17.0
NEBRASKA CITY															
REACH INF,1000AF	5100	181	257	541	590	823	619	353	300	294	148	146	234	922	317	185
INF ADJST,1000AF	-1852	-55	-71	-188	-204	-307	-247	-157	-123	-98	-47	-47	-62	-97	-101	-63
MOD INF,1000AF	3248	109	135	353	346	516	349	196	177	196	98	98	171	165	215	122
FLOW, 1000AF	21668	452	698	2288	2267	2383	2323	2048	1894	1873	908	833	1047	970	1054	625
FLOW, 1000CFS	29.9	32.6	39.1	38.4	36.9	40.1	37.8	33.3	31.8	30.5	30.5	28.0	17.0	15.8	18.8	21.0
KANSAS CITY															
REACH INF,1000AF	9659	218	280	933	1068	1630	1467	769	729	580	261	265	380	370	455	250
INF ADJST,1000AF	-2288	-24	-31	-137	-262	-432	-447	-389	-231	-139	-47	-47	-68	-44	-57	-27
MOD INF,1000AF	7371	194	249	796	805	1197	1020	456	499	451	214	214	322	325	398	222
FLOW, 1000AF	29039	408	928	3083	3072	3584	3346	2589	2401	2332	1120	1076	1389	1298	1446	840
FLOW, 1000CFS	40.1	43.9	52.0	51.8	50.0	60.2	54.3	40.8	40.4	37.9	37.7	34.8	22.8	21.1	25.8	28.3
WOODVILLE															
REACH INF,1000AF	5985	185	238	847	740	752	380	282	414	389	190	190	323	312	382	289
INF ADJST,1000AF	-689	-14	-18	-61	-78	-69	-107	-76	-59	-53	-19	-19	-19	-24	-35	-19
MOD INF,1000AF	5295	171	219	785	632	683	453	209	354	332	173	173	283	288	347	193
FLOW, 1000AF	34335	741	1129	3868	3705	4270	3790	2716	2745	2672	1281	1247	1713	1587	1788	1027
FLOW, 1000CFS	47.4	53.4	63.3	65.0	60.3	71.8	61.6	44.2	46.5	43.5	43.4	42.6	27.9	29.8	31.9	34.5
HERMANN															
REACH INF,1000AF	11795	359	442	1567	1576	1311	978	586	784	419	356	356	695	801	765	403
INF ADJST,1000AF	-558	-27	-35	-115	-132	14	-55	-5	130	-92	-34	-34	-48	-42	-48	-31
MOD INF,1000AF	11236	331	426	1451	1443	1319	923	581	884	727	322	322	647	759	716	372
FLOW, 1000AF	45571	1054	1346	5322	5148	5597	4712	3299	3654	3401	1613	1601	2375	2348	2501	1399
FLOW, 1000CFS	62.9	76.0	86.6	89.4	83.7	94.1	76.8	53.7	61.4	58.3	54.2	53.8	38.6	38.2	42.8	46.9

PLATE 8

SUMMARY: STUDY 1974-2000,*5000 PERIOD 1928-1972

	22MAY	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	30NOV	31DEC	31JAN	28FEB	15MAR
FORT PECK															
REACH INF,1000AF	7261	172	221	672	1112	1604	797	387	332	389	151	181	325	927	345	197
EVAP,1000 AF	392	0	0	0	26	39	75	79	74	50	23	23	19	0	0	0
INF ADJST,1000AF	-1209	-1	-4	-93	+546	-931	-364	-117	16	6	10	16	-7	55	43	94
MID INF,1000AF	5540	170	219	579	759	1174	377	187	276	340	174	174	298	382	429	198
STORAGE,1000AF	10249	11727	11776	11800	12102	12756	12709	12571	12521	12465	12464	12397	12149	11927	11797	11678
POOL ELEV,FT MSL	2216.7	2216.9	2216.2	2216.4	2216.2	2221.6	2221.4	2220.6	2220.2	2219.7	2219.7	2219.1	2218.0	2216.8	2216.2	2215.5
RELEASE,1000AF	5634	117	169	554	438	417	426	325	335	394	175	241	567	604	559	314
RELEASE,1000CFS	7.6	8.4	9.5	9.4	7.5	7.0	6.9	5.3	5.5	6.4	5.9	6.1	8.9	9.8	10.0	10.6
AVERAGE POWER,MW	100	108	193	121	97	92	91	68	69	81	74	103	116	127	128	134
PEAK POWER,MW		181	192	182	184	167	186	186	185	184	194	183	183	182	181	181
ENERGY,1000MWH	801.8	16.7	26.8	87.1	72.3	66.5	66.3	50.9	50.0	60.5	27.0	37.4	86.5	94.6	87.1	48.6
GARRISON																
REACH INF,1000AF	12154	328	396	1165	1527	2816	1787	941	487	919	253	251	265	324	340	352
EVAP,1000 AF	422	0	0	0	27	29	92	86	81	54	24	24	19	0	0	0
INF ADJST,1000AF	-3795	-19	-13	-197	+458	-835	-719	-494	-364	-259	-79	-79	-65	-84	-95	-12
MID INF,1000AF	12577	419	595	1523	1299	2372	1412	383	367	801	275	341	707	823	863	654
STORAGE,1000AF	13670	12251	12501	13063	13548	14966	15507	14889	14335	13982	13763	13507	13074	12561	12110	12073
POOL ELEV,FT MSL	1822.0	1816.4	1817.7	1819.9	1821.7	1827.3	1828.9	1828.6	1824.4	1823.1	1822.3	1821.4	1819.7	1817.6	1815.8	1815.8
RELEASE,1000AF	12959	244	403	981	824	954	671	1202	921	974	474	598	1138	1338	1294	692
RELEASE,1000CFS	17.4	17.9	15.4	16.0	13.2	16.0	14.2	19.3	15.5	15.9	15.9	20.1	18.5	21.8	23.1	23.3
AVERAGE POWER,MW	225	206	176	193	197	193	172	198	187	189	159	237	214	253	256	266
PEAK POWER,MW		395	399	426	411	425	426	421	416	414	452	409	404	398	392	392
ENERGY,1000MWH	1919.0	34.7	40.5	139.4	117.3	139.7	128.7	147.9	134.8	141.0	68.2	85.6	162.2	188.5	180.6	96.0
OAHE																
REACH INF,1000AF	2251	159	173	475	275	472	182	93	124	64	50	50	-20	6	47	169
EVAP,1000 AF	349	0	0	0	26	28	70	70	64	42	19	19	16	0	0	0
INF ADJST,1000AF	-1045	-29	-18	-135	+176	-231	-233	-85	-129	-34	-8	-8	+4	28	-6	-33
MID INF,1000AF	13449	569	414	1328	867	1577	750	899	861	961	491	615	1140	1173	1374	827
STORAGE,1000AF	15659	13621	14177	14870	15539	16526	15781	15644	15061	15721	15764	15938	15722	15159	13975	14486
POOL ELEV,FT MSL	1967.4	1951.0	1952.6	1957.2	1961.6	1966.6	1962.5	1961.4	1957.5	1958.1	1958.2	1958.8	1958.1	1954.9	1948.7	1950.0
RELEASE,1000AF	14705	158	306	1199	1208	1176	1475	1536	1354	901	428	442	1356	937	958	746
RELEASE,1000CFS	19.9	11.1	20.2	20.2	21.5	19.8	24.0	25.0	22.8	14.7	14.4	14.9	22.1	15.2	15.5	14.3
AVERAGE POWER,MW	282	134	240	241	250	237	296	297	270	174	170	176	263	177	176	182
PEAK POWER,MW		416	615	611	596	604	593	586	577	581	586	589	583	592	604	612
ENERGY,1000MWH	1932.7	22.6	82.9	173.7	155.6	176.6	213.0	221.2	194.5	129.7	62.5	83.5	148.8	132.3	85.9	36.7
BIG BEND																
EVAP,1000 AF	67	0	0	0	6	5	12	13	12	8	4	4	3	0	0	0
AVERAGE POWER,MW	64	62	64	64	65	76	112	117	107	72	72	74	110	75	50	39
PEAK POWER,MW		492	491	486	487	497	497	502	504	531	535	535	530	508	497	493
ENERGY,1000MWH	771.5	46.1	47.5	47.0	42.0	56.6	83.9	87.5	77.2	54.0	26.0	26.9	82.1	56.2	34.2	14.3
FORT RANDALL																
REACH INF,1000AF	836	64	79	187	182	156	97	58	31	9	11	11	-15	9	31	76
EVAP,1000 AF	83	0	0	0	5	3	13	13	11	7	3	2	2	0	0	0
INF ADJST,1000AF	-1161	-44	-29	-19	-62	-34	-23	-11	-9	-1	1	1	1	1	0	0
MID INF,1000AF	14028	715	661	1527	1178	1671	1483	1529	1352	892	432	446	1335	946	819	547
STORAGE,1000AF	14985	13721	14	1427	1019	1253	1156	2916	2818	2183	2157	2261	2795	3164	3257	3292
POOL ELEV,FT MSL	1362.0	1354.2	1354.6	1358.6	1359.9	1356.1	1349.2	1346.3	1345.1	1338.4	1338.9	1339.1	1346.1	1351.5	1352.8	1353.2
RELEASE,1000AF	13867	780	743	1532	1460	1379	1650	1600	1420	1348	847	1041	1334	933	777	623
RELEASE,1000CFS	19.1	13.6	17.2	24.0	23.7	23.6	27.0	27.3	23.9	21.9	21.8	18.5	9.8	9.4	9.4	9.5
AVERAGE POWER,MW	267	140	164	212	204	211	232	256	207	175	141	83	84	57	64	80
PEAK POWER,MW		367	367	367	364	355	349	338	333	332	327	288	347	367	367	367
ENERGY,1000MWH	1423.6	77.5	77.1	152.4	150.5	147.1	173.4	171.2	148.4	130.1	62.5	51.6	62.3	64.0	59.3	32.0

	22MAY	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	30NOV	31DEC	31JAN	28FEB	15MAR
WHITE RIVER															
REACH INF,1000AF	2417	54	72	151	148	171	103	93	89	104	45	45	77	79	113	84
EVAP,1000 AF	28	0	0	0	1	1	5	5	6	3	1	1	1	0	0	0
INF ADJST,1000AF	-287	-7	-6	-5	-28	-63	-60	-52	-33	-18	-4	0	7	9	4	-4
MID INF,1000AF	10163	354	430	1461	974	1496	1698	1716	1471	1431	592	594	947	662	615	343
RELEASE,1000CFS	21.9	10.3	23.1	14.0	25.9	23.0	27.6	27.9	24.7	24.1	23.3	22.0	11.2	10.8	11.3	11.5
AVERAGE POWER,MW	79	79	82	84	87	87	91	87	78	74	72	66	42	40	43	43
PEAK POWER,MW		93	93	106	100	106	110	109	105	104	103	97	85	84	85	85
ENERGY,1000MWH	521.4	11.8	17.8	62.2	59.9	62.6	67.8	65.4	58.5	55.4	26.3	24.1	31.4	30.4	29.2	15.8
MAIN STEM SYSTEM															
REACH INF,1000AF	44615	935	1074	2880	3264	5462	3293	2305	1237	1115	494	494	548	742	1073	992
EVAP,1000 AF	1423	0	0	0	91	99	258	270	250	168	76	76	63	0	0	0
INF ADJST,1000AF	-6631	-8	-68	+466	+2186	-1732	-1440	-784	+523	-301	-51	-51	-28	15	-28	-57
STORAGE,1000AF	44552	41941	42417	43447	45644	47433	47023	45478	44304	41486	41228	42878	42711	42780	43019	43499
ALPHA E,KWH/AF	526	774	699	953	943	967	987	1002	918	779	751	803	834	760	726	679
PEAK POWER,MW		2147	2115	2199	2184	2176	2184	2141	2122	2131	2137	2104	2136	2133	2129	2133
ENERGY,1000MWH	7492.4	118.3	194.2	672.0	672.2	653.6	735.1	746.2	651.9	580.0	271.3	289.2	513.3	566.9	476.3	243.3
SIOUX CITY																
REACH INF,1000AF	1543	82	159	271	249	224	154	102	70	48	20	21	21	14	74	93
INF ADJST,1000AF	-156	-1	-1	-10	-6	-56	-58	-22	-5	0	5	5	12	10	7	-5
MID INF,1000AF	1465	80	158	254	196	168	105	79	65	57	25	25	33	25	81	90
FLOW,1000AF	10403	535	916	1754	1759	1654	1803	1796	1537	1490	737	620	720	668	715	439
FLOW,1000CFS	22.8	24.0	28.6	28.6	28.0	27.6	29.3	29.2	25.8	24.2	24.1	20.9	11.7	11.2	12.8	14.6
OMAHA																
REACH INF,1000AF	1412	46	96	171	127	136	196	145	87	58	34	34	43	38	78	91
INF ADJST,1000AF	-402	-11	-14	-36	-60	-90	-142	-118	-49	-12	-7	-7	-4	-3	-18	-12
MID INF,1000AF	1010	35	82	135	68	46	54	-12	38	46	28	26	39	35	60	79
FLOW,1000AF	17290	514	962	1837	1816	1703	1855	1781	1589	1439	744	664	779	725	748	467
FLOW,1000CFS	23.7	24.5	32.4	30.9	29.9	29.6	30.2	29.0	26.3	25.0	25.0	22.3	12.7	11.8	13.7	15.7
NEBRASKA CITY																
REACH INF,1000AF	5111	161	227	541	520	823	615	353	300	294	148	144	216	222	317	185
INF ADJST,1000AF	-1892	-55	-71	-188	-204	-307	-247	-157	-123	-98	-47	-47	-42	-57	-101	-63
MID INF,1000AF	3240	116	155	191	146	516	367	195	177	194	98	98	174	165	215	122
FLOW,1000AF	20441	576	874	2190	2163	2680	2202	1979	1746	1736	844	768	1171	1069	992	588
FLOW,1000CFS	27.2	31.4	37.6	36.8	35.2	36.3	35.8	32.2	29.3	28.2	28.4	25.8	15.6	14.5	17.5	19.8
KANSAS CITY																
REACH INF,1000AF	6650	214	260	931	1108	1610	1457	769	729	980	261	251	381	370	455	253
INF ADJST,1000AF	-2288	-24	-31	-137	+262	-432	-447	-309	+231	-128	-47	-47	-58	-44	-57	-27
MID INF,1000AF	7021	194	249	596	845	1197	1020	459	497	491	214	214	332	325	398	222
FLOW,1000AF	47812	992	915	2984	4969	3481	3218	2438	2258	2192	1059	1006	1306	1219	1374	803
FLOW,1000CFS	28.4	42.7	55.7	50.0	48.5	56.6	52.3	39.7	37.9	35.7	35.6	32.8	21.2	19.8	24.5	27.0
EDDYVILLE																
REACH INF,1000AF	5965	186	278	847	710	752	870	262	414	385	190	190	323	312	382	209
INF ADJST,1000AF	-469	-14	-16	-61	-78	-69	-157	-76	-89	-53	-17	-17	-19	-26	-35	-15
MID INF,1000AF	3253	171	219	785	632	683	453	255	154	332	173	173	283	286	347	193
FLOW,1000AF	53206	725	1206	1774	3601	4167	3667	2644	2626	2829	1253	1201	1416	1527	1716	989
FLOW,1000CFS	49.7	59.2	82.7	83.4	58.8	70.0	59.6	43.0	44.1	41.1	41.4	40.4	26.3	24.5	30.6	33.3
HERMANN																
REACH INF,1000AF	12745	350	462	1567	1576	1811	976	586	754	819	356	356	495	501	765	483
INF ADJST,1000AF	-566	-27	-19	-115	+172	14	-55	-5	130	-92	-14	-14	-49	-42	-48	-31
MID INF,1000AF	12179	323	426	1451	1443	1825	923	581	884	727	326	322	547	459	716	452
FLOW,1000AF	66345	1038	1523	3226	5045	5695	4589	3225	3518	3258	1555	1515	2277	2067	2439	1356
FLOW,1000CFS	61.2	74.8	85.4	87.8	82.0	92.3	74.6	52.5	59.1	53.0	52.3	51.6	37.0	36.9	43.4	45.7

PLATE 9

SUMMARY, STUDY 1-74-2000 PERIOD 1898-1972

	28MAR	31MAY	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	30NOV	31DEC	31JAN	28FEB	15MAR
FORT PECK															
REACH INF,1000AF	7201	172	201	672	1112	1824	797	383	332	185	181	181	325	327	365	197
EVAP,1000 AF	421	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INF ADJST,1000AF	-7429	6	2	-76	-278	-486	-357	-71	50	28	28	28	24	74	93	4
MOD INF,1000AF	5919	176	220	597	834	1339	439	312	383	159	162	182	317	401	449	201
ST RAISE,1000AF	13910	12784	13012	13048	13366	14029	13998	13981	13796	13733	13714	13648	13399	13174	13096	12935
POOL ELEVATION MSL	2227.0	2224.5	2224.6	2225.0	2226.8	2229.6	2229.4	2228.7	2228.3	2227.9	2227.8	2227.4	2226.3	2225.4	2224.9	2224.5
RELEASE,1000AF	5988	120	179	595	488	431	642	383	384	422	421	248	573	622	567	322
RELEASE,1000CFS	8.1	1.7	10.0	9.4	7.8	7.0	7.2	9.4	6.2	6.9	6.8	6.4	9.3	10.1	10.1	10.8
AVERAGE POWER,MW	128	116	134	126	122	98	97	78	82	89	89	111	129	135	135	144
PEAK POWER,MW		190	190	190	191	192	192	191	191	190	190	190	190	190	190	189
ENERGY,1000MWH	953.1	19.5	29.0	91.1	78.6	70.9	72.4	58.6	59.1	68.5	32.1	40.1	93.0	101.1	92.1	51.9
GARRISON															
REACH INF,1000AF	11154	526	396	1169	1347	2810	1787	641	487	519	203	203	265	304	380	352
EVAP,1000 AF	458	0	0	0	33	22	88	96	88	58	26	26	21	0	0	0
INF ADJST,1000AF	-2292	24	14	-83	-392	-720	-564	-341	-242	-146	-19	-19	39	39	28	29
MOD INF,1000AF	14292	455	689	1641	1412	2499	1973	986	925	736	359	407	853	986	976	765
STORAGE,1000AF	19180	13854	14172	14726	15214	16961	17053	16342	15719	15247	15079	14861	14516	14168	13685	13666
POOL ELEVATION MSL	1830.0	1825.4	1826.6	1828.6	1830.5	1839.1	1838.1	1833.9	1831.8	1830.5	1829.7	1829.0	1827.7	1826.0	1824.6	1824.6
RELEASE,1000AF	14264	260	291	1091	924	1151	1041	1279	1150	1004	527	625	1198	1414	1399	724
RELEASE,1000CFS	19.7	10.7	10.3	18.3	15.0	19.4	17.6	20.8	19.3	19.6	17.7	21.0	19.5	23.0	24.3	24.3
AVERAGE POWER,MW	751	215	198	212	178	230	216	248	231	232	209	247	227	266	279	278
PEAK POWER,MW		422	420	413	418	430	429	425	420	417	415	415	409	404	399	400
ENERGY,1000MWH	2025.8	34.2	80.7	152.9	150.9	168.1	193.5	184.9	166.4	173.7	75.4	89.0	169.3	198.0	189.4	100.4
OAHE															
REACH INF,1000AF	2251	150	193	479	275	472	182	93	124	86	30	30	-26	6	47	169
EVAP,1000 AF	159	0	0	0	29	17	88	86	62	41	19	19	15	0	0	0
INF ADJST,1000AF	-1194	-29	-17	-137	-208	-273	-284	-109	+143	-31	10	10	48	28	-6	-33
MOD INF,1000AF	19021	381	446	1421	988	1334	911	1194	1069	1198	949	647	1203	1449	1400	860
STORAGE,1000AF	23397	14532	14972	16673	16179	14406	13423	12906	12434	12488	12542	12667	12498	12971	13731	14323
POOL ELEVATION MSL	1587.4	1592.3	1592.6	1592.6	1592.3	1590.2	1588.8	1588.2	1587.9	1588.1	1588.3	1588.5	1588.0	1588.5	1589.2	1591.5
RELEASE,1000AF	14993	163	406	1327	1247	1297	1696	1672	1542	1143	495	502	1392	976	640	268
RELEASE,1000CFS	20.7	11.7	22.8	22.3	25.9	22.6	27.6	27.9	25.8	18.6	10.7	10.9	22.6	15.9	11.4	9.0
AVERAGE POWER,MW	245	142	270	269	259	280	324	323	306	221	109	202	259	185	138	181
PEAK POWER,MW		614	615	610	621	600	587	580	574	561	564	564	593	635	612	
ENERGY,1000MWH	2191.8	23.9	58.3	191.4	212.9	187.9	241.7	240.5	221.0	164.8	72.0	72.8	193.1	137.7	91.7	42.3
BIG BEND															
EVAP,1000 AF	51	0	0	0	4	3	11	12	11	8	3	3	3	0	0	0
AVERAGE POWER,MW	98	55	108	102	102	101	128	127	124	91	83	84	113	76	54	43
PEAK POWER,MW		493	490	478	492	485	492	499	500	532	536	536	530	507	496	493
ENERGY,1000MWH	862.7	9.4	72.9	74.0	72.3	72.9	95.4	94.8	87.4	67.8	30.2	30.5	84.3	58.5	37.2	15.5
FORT RANDALL															
REACH INF,1000AF	836	56	75	137	135	156	97	30	31	9	11	11	-15	0	31	78
EVAP,1000 AF	55	0	0	0	4	3	11	11	10	6	2	2	2	0	0	0
INF ADJST,1000AF	-173	-4	-2	-20	-31	-44	-32	-14	-10	-1	0	0	1	0	0	-5
MOD INF,1000AF	25942	229	476	1443	1286	1402	1696	1664	1541	1138	502	507	1372	985	671	340
STORAGE,1000AF	3777	3161	3249	3159	3117	3010	2877	2721	2636	2491	2419	2396	2508	2923	3409	3836
POOL ELEVATION MSL	1353.3	1353.0	1354.1	1354.0	1353.8	1353.4	1352.9	1352.0	1351.2	1349.4	1348.5	1348.2	1348.2	1351.6	1352.9	1353.3
RELEASE,1000AF	25934	217	479	1432	1260	1311	1828	1821	1627	1320	752	830	666	842	585	312
RELEASE,1000CFS	421.6	15.7	21.3	24.1	20.2	21.3	29.6	29.7	27.3	24.7	24.6	21.2	11.2	10.5	10.4	10.5
AVERAGE POWER,MW	176	136	192	204	202	213	264	262	262	197	161	159	89	89	91	92
PEAK POWER,MW		355	304	351	358	349	340	328	322	297	279	288	327	349	354	385
ENERGY,1000MWH	1946.1	27.7	59.7	148.6	165.8	158.5	181.7	180.2	180.2	144.7	65.3	59.4	66.4	64.4	62.1	33.3

	22MAR	31MAY	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	30NOV	31DEC	31JAN	28FEB	15MAR
GAVINS POINT															
REACH INF,1000AF	2417	36	72	156	149	173	103	93	89	106	45	45	77	79	103	84
EVAP,1000 AF	22	0	0	0	1	1	6	6	6	2	1	1	1	0	0	0
INF ADJST,1000AF	-179	-3	-3	-8	-27	-37	-17	-23	-18	-14	-2	-2	2	3	2	-4
RELEASE,1000AF	16784	277	466	1581	1727	1845	1895	1886	1693	1809	773	872	749	729	691	372
RELEASE,1000CFS	23.1	19.4	25.0	26.6	29.1	27.7	30.7	30.7	28.5	28.2	26.0	22.6	12.2	11.8	12.3	12.5
AVERAGE POWER,MW	87	91	79	82	83	82	86	85	80	74	72	64	39	37	38	39
PEAK POWER,MW		83	93	97	102	99	98	97	93	91	90	88	71	88	89	89
ENERGY,1000MWH	593.4	10.7	16.2	57.9	62.4	59.7	66.0	63.9	58.2	55.2	29.3	23.4	29.1	27.7	26.4	14.2
MAIN STEM SYSTEM															
REACH INF,1000AF	24465	836	1074	2881	3224	5446	3293	1305	1137	1135	494	494	848	742	1003	952
EVAP,1000 AF	1359	0	0	0	94	67	266	278	257	172	78	78	64	0	0	0
INF ADJST,1000AF	-5252	-8	-11	-350	-900	-1861	-1325	-597	+378	-157	19	19	115	157	114	+9
STORAGE,1000AF	49700	46227	46761	47443	47913	49043	49198	47866	46417	45956	45191	44928	44829	44073	45317	45796
AVERAGE POWER,MW	928	721	956	914	901	988	1259	1125	1044	905	833	863	853	792	738	710
PEAK POWER,MW		2154	2166	2152	2191	2197	2140	2124	2102	2117	2096	2084	2112	2113	2115	2121
ENERGY,1000MWH	6138.8	122.1	278.3	725.9	749.9	711.4	815.8	822.4	752.2	673.6	300.1	310.9	635.2	589.4	530.9	295.6
SIOUX CITY															
REACH INF,1000AF	1543	82	175	271	249	224	164	102	73	48	20	20	21	14	74	93
INF ADJST,1000AF	-290	-1	+1	+26	-87	-98	+99	-36	-11	9	5	5	13	51	7	+1
MOD INF,1000AF	1253	81	177	297	158	127	65	66	58	57	26	26	34	28	82	93
FLOW,1000AF	16160	590	993	1821	1689	1771	1955	1952	1752	1867	820	898	801	791	773	484
FLOW,1000CFS	24.8	25.7	30.4	30.6	33.7	28.8	31.8	31.8	29.4	27.1	26.9	23.9	13.0	12.2	13.8	15.6
OMAHA															
REACH INF,1000AF	1326	44	96	171	117	198	196	105	87	59	34	34	43	38	78	50
INF ADJST,1000AF	-1076	-19	-78	-66	-104	-164	-240	-198	-116	-28	-19	-19	-16	-19	-30	-21
MOD INF,1000AF	235	65	12	105	13	32	+43	+92	-28	29	18	18	28	22	48	29
FLOW,1000AF	15226	547	966	1927	1849	1838	1908	1896	1732	1707	818	735	852	774	815	488
FLOW,1000CFS	23.2	29.3	31.7	32.4	30.9	32.4	31.0	30.2	29.1	27.7	27.5	24.9	13.9	12.8	14.9	16.1
NEBRASKA CITY															
REACH INF,1000AF	3110	151	207	541	533	823	615	353	300	294	148	148	274	222	317	185
INF ADJST,1000AF	-1376	-77	-95	-255	-359	-593	-313	-169	-149	-131	-82	-82	-93	-85	-129	-84
MOD INF,1000AF	2744	97	116	286	291	430	302	183	151	162	83	83	140	137	187	101
FLOW,1000AF	23458	824	874	1614	1590	2239	2210	2021	1886	1867	901	826	1000	934	1001	587
FLOW,1000CFS	38.1	50.6	47.7	37.2	35.8	37.6	36.9	32.9	31.7	30.4	30.3	27.7	16.3	14.9	17.9	19.7
KANSAS CITY															
REACH INF,1000AF	9659	216	298	931	1088	1630	1467	769	729	980	261	261	380	370	455	252
INF ADJST,1000AF	-3510	-47	-60	-252	-350	-964	-884	-575	-318	-218	-62	-62	-102	-88	-122	-93
MOD INF,1000AF	8348	171	227	681	726	1265	883	594	413	861	178	178	279	281	332	166
FLOW,1000AF	67706	557	871	2497	2699	3308	3089	2411	2312	2236	1079	1027	1312	1199	1324	778
FLOW,1000CFS	37.7	40.1	48.8	40.7	47.1	53.8	50.2	39.2	38.9	36.4	36.3	34.5	21.3	19.9	23.7	26.1
WOODVILLE															
REACH INF,1000AF	9465	185	276	847	710	752	560	282	414	385	190	190	323	312	392	209
INF ADJST,1000AF	-963	-26	-74	-92	-111	-96	-122	-85	-73	-69	-30	-30	-56	-49	-43	-30
MOD INF,1000AF	3021	158	203	754	628	656	477	197	340	315	159	159	267	264	319	179
FLOW,1000AF	32328	674	1052	3652	3540	3966	3922	2607	2864	2960	1238	1210	1611	1466	1640	948
FLOW,1000CFS	44.6	46.7	59.0	61.4	57.0	64.7	63.3	42.4	44.8	45.6	41.6	40.7	26.2	23.9	29.3	31.9
HERMAN															
REACH INF,1000AF	11798	359	462	1567	1576	1311	978	586	794	819	356	356	695	801	765	486
INF ADJST,1000AF	-804	-31	-4	-129	-151	-15	-104	-91	103	-101	-38	-38	-63	-55	-58	-39
MOD INF,1000AF	12973	328	424	1438	1424	1296	874	525	857	718	317	317	632	745	708	371
FLOW,1000AF	43502	986	1443	5090	4933	5266	4396	3132	3527	3283	1555	1519	2260	2213	2344	1316
FLOW,1000CFS	59.8	71.0	82.0	82.8	82.2	88.5	71.5	50.9	59.3	58.4	52.3	51.6	36.8	36.0	41.8	44.2

PLATE 10

SUMMARY STUDY 1 74-2021, 7750 PERIOD 1898-1972

	30JAN	28FEB	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	30NOV	30NOV	31DEC	31JAN	28FEB	30MAR
FORT PECK															
REACH INF,1000AF	7201	172	221	672	1112	1024	797	581	332	385	191	191	325	327	269	197
EVAP,1000 AF	407	0	0	0	0	47	19	78	87	77	52	24	26	0	0	0
INF ADJST,1000AF	-929	-4	9	-74	-298	-488	-307	-71	32	28	25	26	19	74	83	4
MID INF,1000AF	5929	176	226	609	988	1059	611	226	326	561	193	193	361	401	440	281
STORAGE,1000AF	10957	12399	12464	12468	12708	13468	13439	13304	13253	13197	13184	13123	12866	12839	12496	12396
END, ELEV,FT MSL	2221.9	2221.0	2221.3	2221.9	2221.2	2222.6	2222.4	2222.4	2225.3	2224.9	2224.8	2224.4	2223.3	2223.3	2221.9	2220.8
RELEASE,1000AF	5910	160	190	574	498	397	458	384	359	419	195	244	973	632	598	387
RELEASE,1000CFS	8.2	8.7	10.1	9.6	7.6	6.7	7.9	5.9	6.0	6.4	6.6	8.2	9.3	10.3	10.7	11.0
AVERAGE POWER,MW	107	116	133	127	100	90	100	79	79	88	88	108	124	136	138	142
PEAK POWER,MW		188	197	187	188	190	189	189	188	188	188	188	187	187	187	188
ENERGY,1000MWH	949.7	19.2	28.9	91.7	74.7	66.8	74.9	58.5	47.3	64.0	31.1	39.7	92.6	101.3	94.2	91.4
GARRISON																
REACH INF,1000AF	11154	308	398	1166	1747	2810	1987	641	487	510	203	203	269	304	380	382
EVAP,1000 AF	443	0	0	0	0	21	88	93	88	54	25	25	20	0	0	0
INF ADJST,1000AF	-2902	9	12	-141	-451	-778	-672	-300	-300	-205	-48	-48	-10	-10	-32	10
MID INF,1000AF	11829	438	588	1354	2198	2407	1576	918	688	674	324	374	709	918	948	690
STORAGE,1000AF	14930	15197	15454	16036	16896	17857	18424	19089	19501	19869	19910	19975	19886	19810	19312	18976
END, ELEV,FT MSL	1827.4	1822.5	1823.7	1825.9	1827.7	1832.1	1834.0	1836.6	1829.3	1827.9	1827.8	1828.5	1829.1	1829.1	1821.7	1821.7
RELEASE,1000AF	13810	297	372	1032	941	1074	1204	1217	1036	1112	478	606	1148	1369	1347	926
RELEASE,1000CFS	23.0	15.0	15.0	17.3	13.7	10.1	10.3	19.8	17.8	18.1	16.1	20.5	19.3	23.7	24.0	24.4
AVERAGE POWER,MW	210	210	190	188	196	214	191	233	210	212	188	239	223	258	273	279
PEAK POWER,MW		392	397	404	400	424	424	418	413	410	407	404	399	393	389	389
ENERGY,1000MWH	1912.8	39.4	38.9	142.7	118.4	154.9	142.7	173.5	151.8	158.2	67.9	89.6	166.0	199.0	189.3	99.1
OAHE																
REACH INF,1000AF	2251	151	193	479	275	473	152	93	124	84	70	70	-26	6	47	169
EVAP,1000 AF	136	0	0	0	29	17	67	67	62	41	19	19	16	0	0	0
INF ADJST,1000AF	-1194	-29	-45	-137	-408	-731	-284	-159	-82	-41	-19	-19	-16	-8	-5	-32
MID INF,1000AF	14392	379	497	1396	1886	1958	974	1063	976	1106	502	510	1194	1438	1987	883
STORAGE,1000AF	17632	14424	14445	14741	16230	16827	17254	17731	17223	17299	17333	17479	17371	17522	17605	17214
END, ELEV,FT MSL	1598.9	1592.1	1592.2	1592.1	1589.9	1589.7	1588.3	1586.6	1592.5	1593.1	1593.6	1594.4	1593.5	1593.1	1588.8	1589.3
RELEASE,1000AF	14343	199	398	1894	1397	1280	1821	1628	1483	1034	466	482	1341	938	805	892
RELEASE,1000CFS	19.8	11.9	22.3	21.8	22.7	21.7	29.4	26.1	24.9	24.8	15.7	16.2	21.8	16.5	13.6	14.5
AVERAGE POWER,MW	294	138	264	256	271	253	310	309	294	200	188	192	249	177	130	184
PEAK POWER,MW		614	613	610	603	598	595	579	572	577	582	586	581	601	555	551
ENERGY,1000MWH	2193.9	23.9	97.1	188.9	202.0	182.9	231.1	230.9	212.1	149.0	67.2	89.3	185.4	131.9	88.4	37.0
BIG BEND																
EVAP,1000 AF	81	0	0	0	4	3	11	12	11	8	3	3	3	0	0	0
AVERAGE POWER,MW	98	56	103	100	109	98	103	102	116	97	78	81	100	75	51	41
PEAK POWER,MW		492	479	484	487	484	488	488	500	531	536	534	531	507	498	498
ENERGY,1000MWH	828.2	9.1	22.9	72.3	78.4	71.0	91.8	90.9	84.0	81.5	28.3	29.9	41.3	56.3	38.2	14.6
FORT RANDALL																
REACH INF,1000AF	916	86	89	137	139	156	97	30	31	9	11	11	-15	9	31	76
EVAP,1000 AF	36	0	0	0	4	3	11	11	10	6	2	2	2	0	0	3
INF ADJST,1000AF	-172	-4	-9	-20	-21	-44	-32	-16	-11	-3	-1	-1	-1	0	0	-6
MID INF,1000AF	14891	221	479	1491	1982	1968	1023	1000	1492	1027	471	487	1321	947	836	526
STORAGE,1000AF	2768	3047	3149	3284	3394	3603	3843	3752	3843	3834	3905	3891	3576	3920	3836	3836
END, ELEV,FT MSL	1368.4	1369.4	1369.9	1369.1	1369.6	1370.3	1369.4	1368.9	1369.5	1369.5	1369.8	1369.7	1368.1	1369.6	1369.8	1369.8
RELEASE,1000AF	14888	211	372	1396	1562	1487	1773	1748	1542	1043	481	501	1336	923	805	584
RELEASE,1000CFS	23.8	15.2	20.9	23.9	25.4	24.2	28.8	28.3	25.9	27.4	23.9	25.2	22.4	9.8	9.8	9.9
AVERAGE POWER,MW	169	131	178	221	216	207	236	231	211	174	146	152	84	86	87	87
PEAK POWER,MW		396	391	385	390	388	328	328	328	277	268	326	342	354	355	355
ENERGY,1000MWH	1469.5	22.1	98.8	149.7	161.0	148.3	175.7	172.1	152.9	129.1	62.8	62.8	61.7	69.6	58.6	31.9

	30JAN	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	30NOV	30NOV	31DEC	31JAN	28FEB	30MAR
GAVINS POINT															
REACH INF,1000AF	2417	91	72	156	148	173	103	93	89	106	45	45	77	79	103	84
EVAP,1000 AF	22	0	0	0	1	1	4	4	4	2	1	1	1	0	0	1
INF ADJST,1000AF	-379	-11	-5	-8	-27	-32	-37	-23	-19	-14	-2	-2	-2	-2	-2	-6
MID INF,1000AF	16110	281	479	1545	1682	1652	1895	1905	1607	1525	741	643	716	696	656	353
STORAGE,1000AF	2210	1901	1974	2063	2174	2268	2339	2352	2343	2334	2305	2301	2576	2920	3036	3036
END, ELEV,FT MSL	1206.0	1205.1	1205.4	1205.7	1206.0	1206.3	1206.5	1206.6	1206.5	1206.4	1206.3	1206.3	1207.1	1208.0	1208.3	1208.3
RELEASE,1000AF	14888	211	372	1396	1562	1487	1773	1748	1542	1043	481	501	1336	923	805	584
RELEASE,1000CFS	23.8	15.2	20.9	23.9	25.4	24.2	28.8	28.3	25.9	27.4	23.9	25.2	22.4	9.8	9.8	9.9
AVERAGE POWER,MW	169	131	178	221	216	207	236	231	211	174	146	152	84	86	87	87
PEAK POWER,MW		396	391	385	390	388	328	328	328	277	268	326	342	354	355	355
ENERGY,1000MWH	1469.5	22.1	98.8	149.7	161.0	148.3	175.7	172.1	152.9	129.1	62.8	62.8	61.7	69.6	58.6	31.9
MAIN STEM SYSTEM															
REACH INF,1000AF	24465	934	1074	2981	3264	5842	3293	1305	1137	1135	494	494	648	742	1003	992
EVAP,1000 AF	1527	0	0	0	92	60	280	271	251	169	78	78	63	0	0	0
INF ADJST,1000AF	-5752	-25	-72	-428	-1542	-1719	-1393	-659	-434	-255	-9	-9	-47	-28	-56	-29
STORAGE,1000AF	45328	44861	45361	46240	48209	48218	47704	46271	45056	44235	43865	43810	43406	43425	43045	44423
AVERAGE POWER,MW	980	709	936	989	934	949	1048	1057	980	840	783	828	825	767	716	688
PEAK POWER,MW		2124	2171	2138	2139	2146	2171	2211	2090	2094	2081	2044	2067	2067	2170	2166
ENERGY,1000MWH	7601.5	119.3	351.9	684.9	695.9	680.5	780.9	787.0	713.1	627.0	282.2	298.7	614.1	571.5	486.8	248.7
SIOUX CITY																
REACH INF,1000AF	1943	91	109	271	225	224	184	152	70	44	20	20	21	14	74	93
INF ADJST,1000AF	-291	-11	-11	-28	-67	-98	-89	-38	-11	-9	-5	-5	-13	-11	-7	-11
MID INF,1000AF	1259	81	173	247	158	127	95	88	57	28	24	14	24	82	67	82
FLOW,1000AF	17346	344	943	1782	840	1729	1902	1871	1888	1681	767	649	796	712	737	468
FLOW,1000CFS	45.9	24.8	30.4	30.1	29.9	29.1	30.9	30.4	28.0	29.7	25.8	22.9	12.2	11.8	13.2	15.8
OMAHA																
REACH INF,1000AF	1312	44	76	171	117	190	196	105	87	59	34	74	43	38	76	50
INF ADJST,1000AF	-1176	-18	-24	-84	-104	-104	-245	-198	-116	-68	-15	-15	-18	-15	-30	-21
MID INF,1000AF	219	28	32	109	13	32	-43	-92	-28	20	18	18	28	22	46	29
FLOW,1000AF	17801	354	950	1859	1953	1768	1854	1778	1845	1619	785	709	800	737	779	469
FLOW,1000CFS	24.3	24.5	31.3	31.7	32.1	28.7	30.2	28.9	27.7	28.3	23.7	23.0	13.0	12.8	12.9	15.8
NEBRASKA CITY																
REACH INF,1000AF	5100	181	217	941	550	837	615	353	350	294	148	148	234	922	317	185
INF ADJST,1000AF	-2378	-71	-98	-259	-258	-392	-353	-189	-149	-131	-65	-62	-93	-85	-129	-86
MID INF,1000AF	4721	87	112	284	201	432	282	183	161	145	83	86	141	137	187	101
FLOW,1000AF	21503	417	669	2175	2145	2198	2195	1949	1960	1784	868	794	948	974	985	587
FLOW,1000CFS	29.3	30.1	37.3	38.6	36.9	36.9	38.1	31.8	30.2	29.0	29.2	26.7	15.4	14.2	17.2	19.1
KANSAS CITY																
REACH INF,1000AF	9959	718	260	933	1068	1477	1467	769	720	580	261	264	380	370	459	250
INF ADJST,1000AF	-5310	-47	-60	-292	-760	-984	-984	-379	-316	-218	-82	-89	-101	-88	-122	-93
MID INF,1000AF	6348	171	220	661	758	1065	883	394	413	361	178	178	279	281	352	196
FLOW,1000AF	25852	550	863	2859	2893	3256	3074	2336	2203	2153	1048	994	1256	1158	1291	750
FLOW,1000CFS	36.8	39.6	48.4	48.1	48.4	54.9	49.4	39.0	37.4	35.0	35.2	33.6	20.9	18.8	23.0	29.5
BOONVILLE																
REACH INF,1000AF	5985	185	210	867	710	752	500	293	414	385	190	190	323	312	382	298
INF ADJST,1000AF	-963	-24	-34	-92	-101	-98	-172	-85	-73	-48	-30	-30	-56	-48	-83	-42
MID INF,1000AF	5021	158	203	754	608	690	437	197	340	315	159	159	267	264	319	179
FLOW,1000AF	31674	869	1054	3610	3064	3924	3467	2533	2575	2477	1204	1161	1556	1425	1529	930
FLOW,1000CFS	43.7	46.2	56.9	60.9	56.3	66.0	56.4	41.2	43.3	40.3	40.9	38.9	25.3	23.2	26.6	31.5
HERMANN																
REACH INF,1000AF	11798	359	442	1567	1578	1811	978	596	754	819	356	356	695	801	765	466
INF ADJST,1000AF	-2824	-41	-40	-120	-153	-15	-104	-61	103	-107	-38	-38	-63	-55	-48	-39
MID INF,1000AF	11973	318	421	1447	1448	1298	874	525	857	735	317	317	632	745	708	374
FLOW,1000AF	41648	1077	1435	4954	4966	5422	4340	3059	3438	3188	1521	1511	2204	2171	2308	1297
FLOW,1000CFS	58.9	70.4	81.9	84.9	79.9	87.8	70.8	49.8	57.8	53.0	51.1	50.8	35.8	35.5	41.2	43.8

SUMMARY, STUDY 1-74-2020, 21400 PERIOD 1898-1972

	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	30NOV	31DEC	31JAN	28FEB	15MAR
FORT PECK														
REACH INF,1000AF	7281	172	221	672	1112	1604	707	383	332	385	181	191	325	527	395	197
EVAP,1000 AF	420	0	0	0	26	29	77	81	74	51	23	25	19	0	0	0
INF ADJST,1000AF	-995	-4	-9	-74	-478	-488	-307	-75	-36	-24	-26	-26	-11	-74	-83	-4
MOD INF,1000AF	5938	178	228	809	726	1058	412	231	307	362	184	184	318	401	449	281
STORAGE,1000AF	12838	12102	12157	12997	12914	13199	13174	12908	12927	12854	12828	12741	12497	12974	12770	12648
POOL ELEV,FT MSL	2222.3	2219.8	2219.8	2220.2	2221.9	2223.5	2223.1	2222.2	2222.3	2222.1	2222.6	2221.4	2220.5	2223.0	2219.8	2219.1
RELEASE,1000AF	9931	518	171	569	490	410	477	379	388	434	221	275	562	624	593	323
RELEASE,1000CFS	8.2	8.4	9.6	9.4	7.7	6.9	7.8	6.2	6.2	7.1	3.6	4.5	9.1	10.2	9.8	10.9
AVERAGE POWER,MW	107	111	127	123	100	92	104	81	79	90	91	117	120	131	129	140
PEAK POWER,MW		184	185	186	187	189	189	188	187	187	186	186	185	185	185	184
ENERGY,1000MWH	942.7	10.7	27.5	89.2	75.0	68.5	77.5	60.3	57.9	67.7	33.1	42.5	89.9	99.0	87.9	52.7
GARRISON														
REACH INF,1000AF	11154	308	396	1165	1327	2810	1787	661	487	519	283	201	265	554	385	352
EVAP,1000 AF	422	0	0	0	27	20	82	88	81	54	24	26	19	0	0	0
INF ADJST,1000AF	-3692	-7	-9	-199	-469	-837	-681	-458	-358	-263	-77	-77	-77	-76	-88	-8
MOD INF,1000AF	12971	410	550	1529	1300	2383	1301	474	413	835	312	372	710	852	645	604
STORAGE,1000AF	13696	12324	12601	13135	13601	14958	15475	14859	14314	13934	13786	13553	13170	12432	12172	12144
POOL ELEV,FT MSL	1854.6	1850.0	1852.1	1853.7	1854.9	1859.3	1861.7	1858.8	1856.4	1854.1	1854.5	1853.6	1851.9	1847.0	1846.1	1846.0
RELEASE,1000AF	12967	292	242	980	838	1007	984	1089	948	1014	462	456	1142	1348	1348	698
RELEASE,1000CFS	67.9	15.0	10.0	16.0	13.6	16.9	16.0	17.7	16.1	16.5	15.0	20.4	18.9	21.8	23.3	23.3
AVERAGE POWER,MW	204	201	191	184	154	194	186	208	169	190	177	232	214	245	250	257
PEAK POWER,MW		374	373	371	367	432	430	429	424	420	396	395	389	382	375	373
ENERGY,1000MWH	1799.7	33.0	39.2	135.8	115.2	141.7	138.1	154.8	139.2	141.4	83.9	83.9	159.7	182.8	174.0	92.7
OAHE														
REACH INF,1000AF	2291	151	191	475	275	472	182	53	124	66	32	32	-26	6	47	169
EVAP,1000 AF	322	0	0	0	24	17	64	64	59	39	18	18	15	0	0	0
INF ADJST,1000AF	-1194	-88	-71	-137	-76	-273	-184	-143	-31	-34	-10	-10	-10	-28	-6	-33
MOD INF,1000AF	10421	391	440	1429	1298	1190	1117	1040	880	1011	483	620	1149	1374	1348	837
STORAGE,1000AF	12627	11788	11870	13005	13487	13473	13725	13095	13161	13030	12871	12844	12720	12200	12053	11575
POOL ELEV,FT MSL	1584.1	1580.3	1580.6	1589.8	1587.5	1587.3	1588.0	1581.4	1581.6	1580.9	1580.4	1580.3	1580.5	1580.6	1580.0	1578.4
RELEASE,1000AF	13712	149	378	1227	1341	1203	1178	1500	1395	1061	1403	1456	1293	1894	1543	1238
RELEASE,1000CFS	167	15.0	21.2	32.6	21.8	20.2	19.8	24.4	23.4	17.8	14.9	15.3	21.0	14.6	10.1	8.0
AVERAGE POWER,MW	221	129	245	241	257	238	299	301	272	181	173	170	237	167	119	97
PEAK POWER,MW		402	401	400	391	388	474	484	476	461	473	560	545	475	400	399
ENERGY,1000MWH	1939.2	25.7	53.7	179.5	191.7	172.0	222.7	224.6	196.5	134.2	82.6	84.5	176.5	124.4	81.3	35.2
BIG BEND														
EVAP,1000 AF	81	0	0	0	4	3	11	12	11	8	3	3	3	0	0	0
AVERAGE POWER,MW	90	91	98	99	101	94	119	121	110	77	74	74	105	72	48	38
PEAK POWER,MW		492	479	476	484	480	496	496	504	532	535	535	531	508	498	492
ENERGY,1000MWH	791.0	9.6	25.3	68.5	75.2	67.9	89.3	90.0	79.4	57.4	26.9	27.7	78.3	53.7	32.6	13.9
FORT RANDALL														
REACH INF,1000AF	838	88	93	137	155	156	97	30	31	9	11	11	-15	9	31	76
EVAP,1000 AF	56	0	0	0	4	3	11	11	10	6	2	2	2	0	0	0
INF ADJST,1000AF	-170	-4	-5	-20	-31	-46	-32	-14	-10	-1	0	0	0	0	0	-9
MOD INF,1000AF	14287	212	476	1544	1438	1329	1977	1581	1304	954	447	460	1273	904	594	310
STORAGE,1000AF	3763	3543	3548	3536	3296	2998	2860	2739	2634	2199	1966	1864	2540	2958	2996	3034
POOL ELEV,FT MSL	1349.3	1353.4	1354.0	1355.0	1354.1	1352.4	1340.9	1347.5	1345.8	1338.4	1334.3	1332.3	1345.8	1351.4	1352.7	1353.2
RELEASE,1000AF	14257	220	553	1534	1499	1407	1715	1703	1490	1091	676	562	577	556	526	271
RELEASE,1000CFS	19.7	14.4	19.0	22.4	24.4	23.7	27.9	27.7	25.2	22.7	22.7	18.9	9.4	9.0	9.1	9.1
AVERAGE POWER,MW	182	124	149	197	226	199	229	226	206	161	167	136	75	78	80	91
PEAK POWER,MW		356	351	350	357	352	345	331	323	293	274	265	325	344	353	355
ENERGY,1000MWH	1429.3	25.0	36.7	138.8	154.8	143.8	170.7	168.7	148.8	134.9	80.4	49.1	56.2	58.1	54.3	20.9

	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	30NOV	31DEC	31JAN	28FEB	15MAR
OAHE														
REACH INF,1000AF	1417	56	72	156	148	173	103	93	89	104	43	45	77	79	103	64
EVAP,1000 AF	22	0	0	0	1	1	4	4	4	2	1	1	1	0	0	0
INF ADJST,1000AF	-179	-4	-5	-8	-27	-35	-39	-23	-10	-14	-2	-2	-2	-3	-2	-4
RELEASE,1000AF	15472	282	420	1482	1416	1542	1776	1769	1565	1482	718	604	696	639	617	331
RELEASE,1000CFS	21.4	18.2	23.9	24.9	26.3	25.9	28.9	28.8	26.3	24.1	24.1	20.1	10.1	14.4	10.9	11.1
AVERAGE POWER,MW	83	91	92	96	98	98	86	82	76	77	68	50	73	32	34	35
PEAK POWER,MW		70	69	95	97	97	97	95	92	90	90	82	48	67	69	69
ENERGY,1000MWH	556.7	9.6	15.3	54.4	50.9	56.2	62.9	61.2	55.1	52.1	24.7	21.5	24.8	24.2	23.3	12.8
MAIN STEM SYSTEM														
REACH INF,1000AF	24485	836	1074	2880	3224	5442	3503	1305	1117	1235	494	494	648	742	1003	952
EVAP,1000 AF	1285	0	0	0	89	64	252	263	243	167	74	73	61	0	8	4
INF ADJST,1000AF	-6452	-42	-54	-498	-1100	-1777	-1445	-714	-492	-277	-38	-38	0	40	-1	-48
STORAGE,1000AF	43562	43597	43903	44276	44934	46465	46025	44919	43792	42851	42287	41818	41773	41851	42157	42838
A.PRAGE POWER,MW	840	875	897	910	901	906	1023	1020	934	791	754	802	784	728	671	650
PEAK POWER,MW		2094	2112	2112	2148	2127	2114	2089	2068	2064	2049	2039	2047	2048	2070	2077
ENERGY,1000MWH	7451.6	113.4	193.8	662.2	670.9	648.0	761.8	735.4	672.8	568.1	271.0	289.0	585.3	542.2	455.6	234.3
SIOUX CITY														
REACH INF,1000AF	1543	82	179	271	229	324	144	102	76	48	20	20	21	14	74	93
INF ADJST,1000AF	-290	-1	-1	-25	-67	-80	-98	-36	-11	-8	-3	-3	-3	-1	-7	-11
MOD INF,1000AF	2253	81	177	247	158	129	46	66	65	40	17	17	18	13	67	82
FLOW, 1000AF	16726	331	524	719	776	1069	1042	1030	1024	1042	744	637	692	664	651	623
FLOW, 1000CFS	23.1	24.9	29.4	28.0	28.9	28.1	30.0	29.8	27.3	28.4	28.0	22.7	11.2	10.8	12.3	14.2
OMAHA														
REACH INF,1000AF	1312	44	96	171	117	198	196	105	87	58	34	34	43	38	76	90
INF ADJST,1000AF	-1278	-18	-24	-66	-104	-164	-240	-198	-116	-28	-15	-15	-18	-15	-30	-21
MOD INF,1000AF	235	28	72	159	13	35	-43	-92	-28	29	18	18	26	22	46	69
FLOW, 1000AF	16741	329	540	1825	1789	1704	1794	1737	1674	1675	763	666	738	688	733	667
FLOW, 1000CFS	23.4	23.7	33.3	30.7	29.1	28.6	29.2	28.3	27.0	28.4	29.8	22.9	12.0	11.2	13.1	15.0
NEBRASKA CITY														
REACH INF,1000AF	5102	161	217	541	552	823	615	353	300	294	148	146	274	322	317	189
INF ADJST,1000AF	-2178	-39	-49	-255	-258	-359	-313	-180	-140	-131	-82	-82	-93	-85	-129	-84
MOD INF,1000AF	2771	87	116	286	291	436	302	173	159	163	83	80	140	137	197	101
FLOW, 1000AF	19435	404	684	2112	2100	2139	2096	1900	1949	1730	848	759	866	825	819	688
FLOW, 1000CFS	27.1	29.1	38.3	35.5	33.9	35.9	34.1	30.9	29.8	29.1	28.9	25.5	14.4	13.9	16.9	16.4
KANSAS CITY														
REACH INF,1000AF	9659	218	280	933	1068	1830	1487	760	729	980	201	261	380	371	455	250
INF ADJST,1000AF	-3315	-47	-60	-292	-340	-584	-584	-375	-318	-918	-82	-82	-101	-88	-122	-93
MOD INF,1000AF	6348	171	220	681	728	1065	883	394	411	361	178	178	279	281	332	196
FLOW, 1000AF	26012	539	844	2796	2789	3904	2974	2293	2185	2109	1029	983	1195	1169	1249	739
FLOW, 1000CFS	35.9	38.8	47.4	47.0	45.4	53.9	48.4	37.3	35.7	34.3	34.5	32.4	19.4	19.0	22.2	24.7
BOONVILLE														
REACH INF,1000AF	5985	185	238	847	710	752	560	282	414	385	190	194	323	312	392	289
INF ADJST,1000AF	-963	-26	-34	-99	-101	-96	-172	-85	-71	-49	-32	-32	-36	-48	-63	-30
MOD INF,1000AF	5021	158	203	754	628	656	437	197	340	319	159	159	247	264	329	179
FLOW, 1000AF	31034	658	1028	3592	3398	3804	3436	2480	2938	2831	1184	1140	1491	1474	1559	907
FLOW, 1000CFS	42.8	47.4	57.6	58.9	55.3	64.9	55.4	40.9	42.7	39.6	38.6	38.6	24.3	23.4	27.9	30.5
HERMANN														
REACH INF,1000AF	11798	359	462	1587	1976	1311	978	586	794	819	358	354	605	801	765	486
INF ADJST,1000AF	-824	-31	-40	-120	-151	-15	-154	-81	183	-183	-38	-38	-43	-55	-88	-35
MOD INF,1000AF	10073	328	421	1438	1424	1296	874	525	857	716	317	317	632	745	706	371
FLOW, 1000AF	42108	967	1439	4991	4822	5162	4278	3014	3401	3151	1501	1470	2138	2120	2283	1274
FLOW, 1000CFS	54.0	49.7	80.8	83.9	78.4	86.8	69.6	49.5	57.2	53.3	50.5	49.7	34.8	34.5	40.4	42.8

PLATE 12

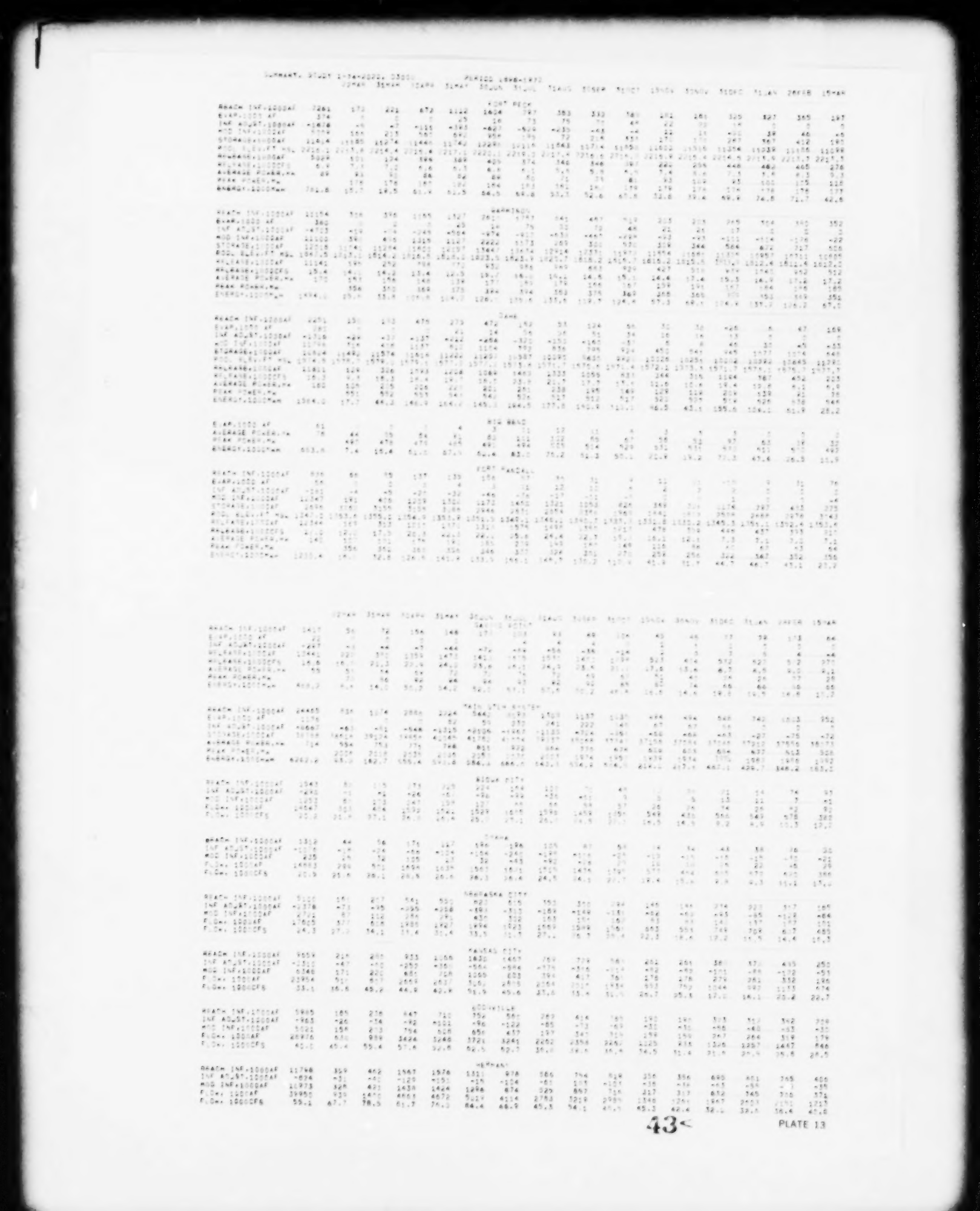


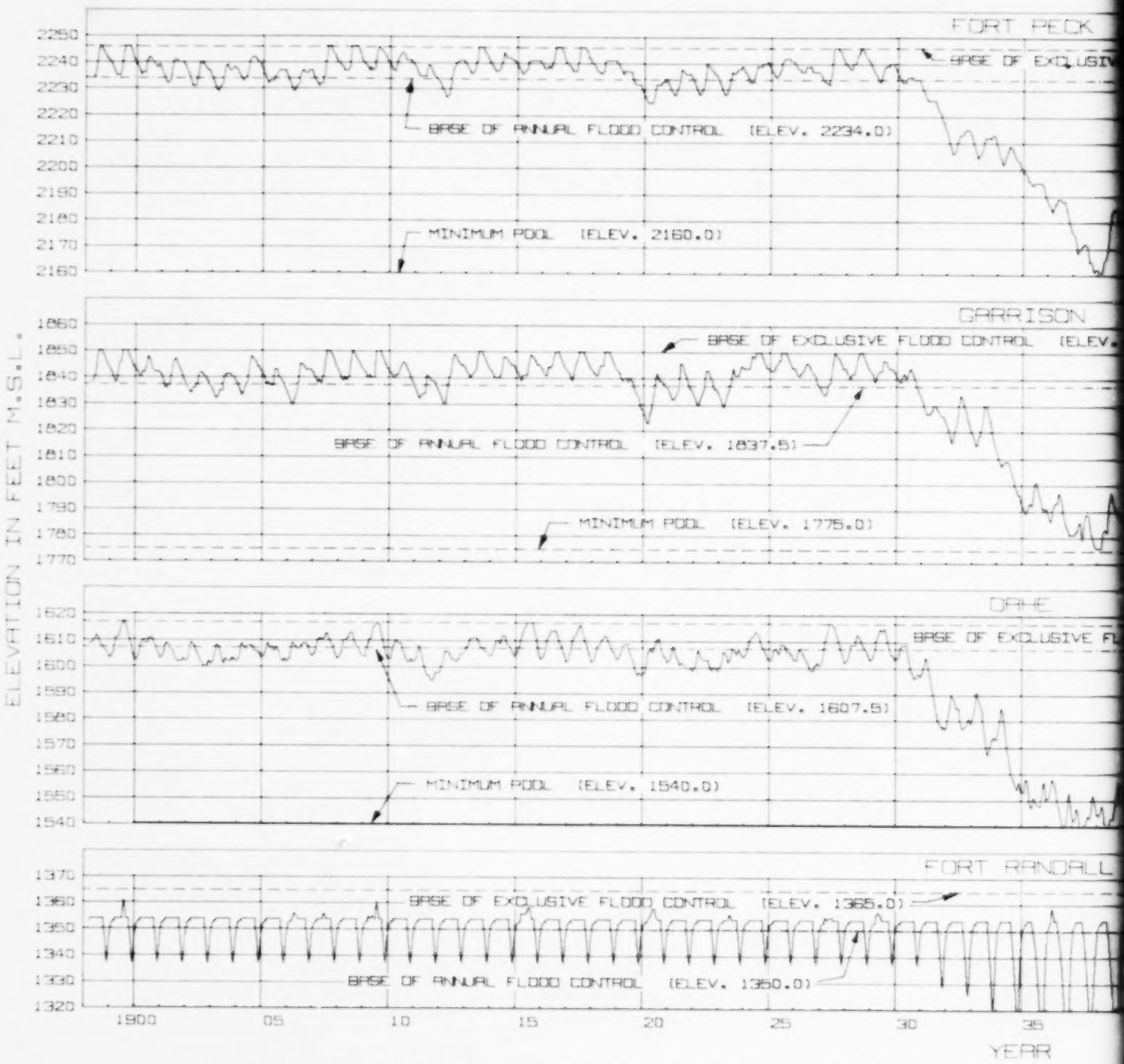
PLATE 13

SUMMARY STUDY 1-28-MARCH7 PERIOD 1898-1972

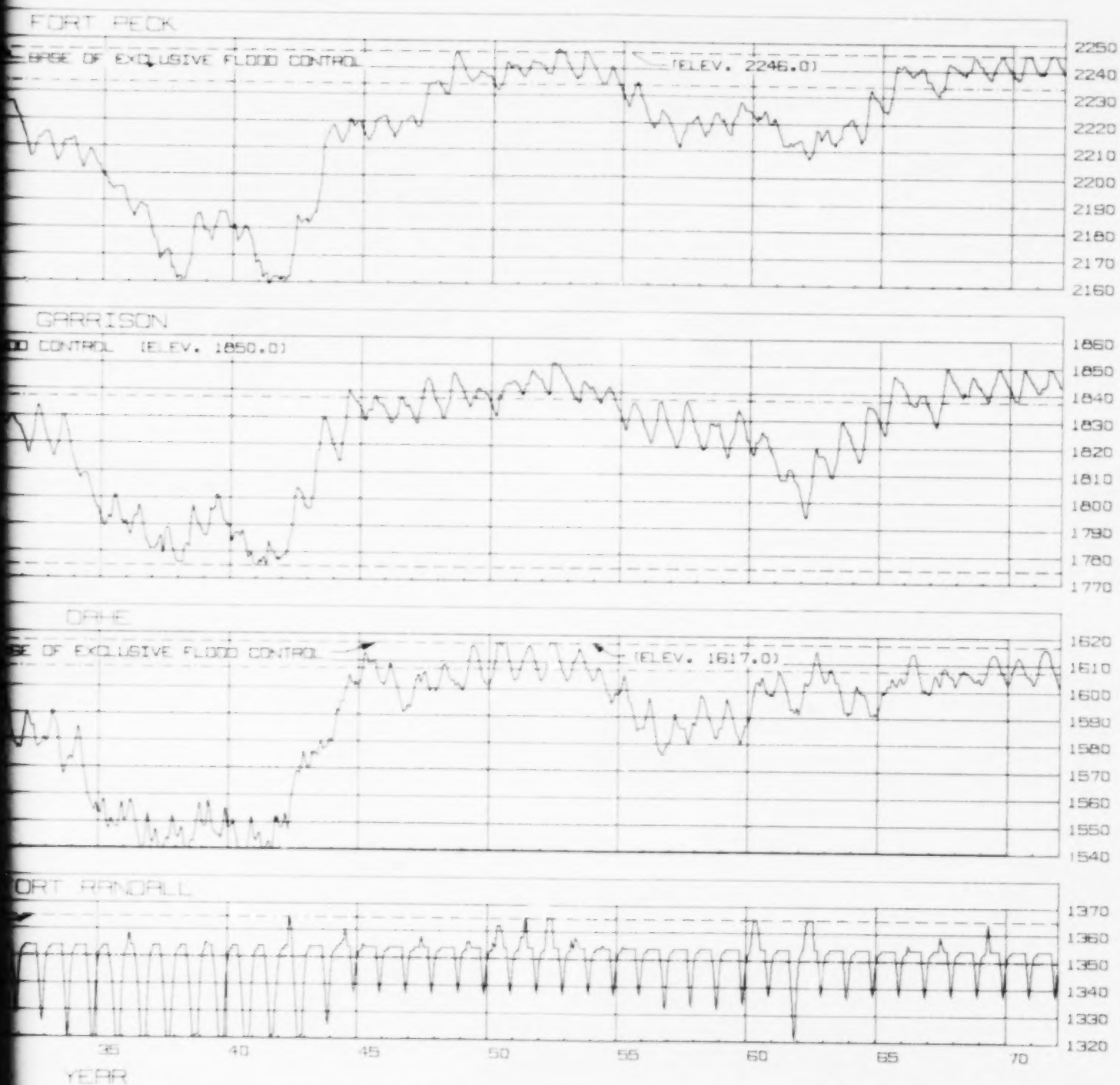
	28MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	19NOV	30NOV	31DEC	31JAN	28FEB	19MAR
FORT PECK															
REACH INF,1000AF	7201	172	721	672	1112	1604	797	383	332	385	181	181	329	927	385	197
EVAP,1000 AF	484	0	0	0	31	39	88	92	86	56	36	26	22	0	0	0
INF ADJ,1000AF	-6223	-19	-19	-131	-417	-998	-954	-858	-48	-48	-9	-9	-98	0	17	-37
MOD INF,1000AF	6503	197	202	537	465	932	1054	941	383	288	145	149	295	539	383	176
STORAGE,1000AF	14819	14999	14997	14928	14948	15313	15971	15970	15972	15972	15972	15972	15972	15972	15972	15972
POOL ELEV,FT MSL	2233.6	2234.9	2234.9	2234.7	2234.8	2235.4	2236.4	2236.4	2236.4	2236.4	2236.4	2236.4	2236.4	2236.4	2236.4	2236.4
RELEASE,1000AF	4992	88	124	399	320	367	294	331	342	373	179	191	446	671	429	229
RELEASE,1000CFS	81	1.4	2.0	6.7	5.2	6.0	4.8	5.6	5.7	6.1	2.9	3.1	7.3	10.9	7.0	3.7
AVERAGE POWER,MW	87	87	89	93	92	85	84	84	79	81	80	80	73	77	77	77
PEAK POWER,MW		192	192	193	193	193	193	192	192	192	192	192	192	189	189	189
ENERGY,1000MWH	764.9	14.7	22.8	66.9	53.0	61.8	49.7	55.3	56.9	67.1	29.9	31.9	74.9	78.6	71.0	38.2
GARRISON																
REACH INF,1000AF	11154	308	394	1148	1327	2810	1787	661	687	919	203	903	269	934	393	392
EVAP,1000 AF	388	0	0	0	0	0	0	122	93	67	28	28	23	0	0	0
INF ADJ,1000AF	-6883	-33	-43	-349	-830	-1316	-1354	-1019	-701	-435	-134	-134	-118	-178	0	-37
MOD INF,1000AF	8388	384	478	1218	793	1836	988	-151	32	484	230	242	521	413	439	243
STORAGE,1000AF	18874	18819	18362	17103	17371	18892	19446	17398	16787	16852	16433	16340	16086	15681	15681	15799
POOL ELEV,FT MSL	1858.4	1858.3	1858.0	1857.0	1857.3	1858.4	1858.8	1858.2	1858.1	1858.2	1858.0	1858.0	1857.8	1857.6	1857.6	1857.7
RELEASE,1000AF	8391	112	171	474	585	813	948	880	644	881	308	536	745	1347	822	446
RELEASE,1000CFS	11.8	1.8	2.9	7.7	9.5	10.3	12.1	14.3	10.8	14.8	5.0	8.7	12.1	21.9	13.8	7.3
AVERAGE POWER,MW	144	101	98	96	109	130	151	146	138	138	141	144	174	180	180	180
PEAK POWER,MW		434	434	434	434	443	441	437	432	432	432	432	431	431	431	431
ENERGY,1000MWH	1066.5	17.1	22.3	73.4	81.2	96.1	112.8	109.0	98.0	102.3	46.9	80.9	119.1	199.7	122.7	69.8
OAHE																
REACH INF,1000AF	2291	190	193	479	279	472	160	83	124	66	30	30	-26	6	67	189
EVAP,1000 AF	407	0	0	0	0	29	71	82	76	51	23	23	19	0	0	0
INF ADJ,1000AF	-1677	-30	-38	-161	-270	-345	-410	-380	-211	-92	0	0	45	29	-8	-34
MOD INF,1000AF	8527	832	286	798	500	720	430	441	488	466	322	350	748	601	666	581
STORAGE,1000AF	19845	19197	18299	18018	18482	18895	19188	19208	19428	19821	19923	19971	19985	19928	19733	19681
POOL ELEV,FT MSL	1998.8	1998.0	1998.6	1997.6	1997.2	1997.3	1998.9	1998.9	1997.2	1998.4	1998.9	1998.8	1998.2	1997.1	1998.2	1997.9
RELEASE,1000AF	8529	84	127	993	630	707	827	913	900	881	308	315	840	478	940	285
RELEASE,1000CFS	11.8	1.4	2.1	9.0	10.3	11.9	13.9	14.9	15.1	13.9	10.3	10.7	13.0	11.0	9.7	8.9
AVERAGE POWER,MW	190	78	92	116	133	154	174	190	192	174	109	153	172	138	122	109
PEAK POWER,MW		648	649	651	651	651	649	648	648	647	644	644	643	647	647	647
ENERGY,1000MWH	1419.9	13.1	22.8	84.1	99.3	111.0	129.8	141.9	138.4	129.7	46.6	48.2	128.9	103.0	83.6	39.9
BIG BEND																
EVAP,1000 AF	85	0	0	0	0	3	11	12	11	8	3	3	3	0	0	0
AVERAGE POWER,MW	97	29	34	48	48	56	64	72	74	68	51	53	49	54	46	41
PEAK POWER,MW		503	496	495	492	488	904	910	912	916	919	919	922	915	911	911
ENERGY,1000MWH	903.9	9.0	7.9	35.8	36.0	40.9	48.2	54.0	55.0	51.0	18.4	19.1	51.4	46.8	31.9	14.9
FORT RANDALL																
REACH INF,1000AF	834	88	98	137	135	156	97	30	31	9	11	11	-19	9	31	74
EVAP,1000 AF	61	0	0	0	4	3	12	12	11	7	3	3	3	0	0	0
INF ADJ,1000AF	-292	-4	-9	-27	-48	-59	-99	-29	-16	-2	0	0	0	0	-1	-9
MOD INF,1000AF	8995	148	207	643	731	797	823	894	893	846	329	320	828	687	970	826
STORAGE,1000AF	2888	2951	3010	3636	3942	3268	2976	2884	2862	2779	2840	2971	2746	2849	2879	2888
POOL ELEV,FT MSL	1391.0	1392.0	1392.9	1395.8	1397.3	1395.4	1391.7	1390.8	1390.6	1389.7	1389.7	1389.7	1389.7	1389.9	1390.9	1391.0
RELEASE,1000AF	8982	78	147	617	709	771	959	946	916	930	424	409	854	984	940	787
RELEASE,1000CFS	12.4	1.4	2.3	10.4	11.9	12.5	15.6	15.9	15.4	15.1	6.9	6.7	13.9	16.0	15.3	12.8
AVERAGE POWER,MW	109	92	74	91	100	112	132	130	129	126	115	109	88	82	84	82
PEAK POWER,MW		391	393	393	393	393	393	393	393	393	393	393	393	393	393	393
ENERGY,1000MWH	924.2	8.8	14.0	69.9	74.6	82.7	98.7	98.4	93.0	93.8	41.7	39.1	69.9	84.1	57.2	33.9

	28MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	19NOV	30NOV	31DEC	31JAN	28FEB	19MAR
SAYLOR CREEK															
REACH INF,1000AF	1417	96	72	194	148	173	103	93	89	126	67	69	77	79	103	84
EVAP,1000 AF	22	0	0	0	1	1	0	4	3	2	1	1	1	0	0	0
INF ADJ,1000AF	-381	-9	-9	-8	-32	-84	-84	-93	-33	-14	-3	-3	2	2	2	-4
REACH,1000AF	15996	183	814	7369	819	880	976	982	988	1019	499	492	733	867	898	777
RELEASE,1000CFS	13.9	9.2	12.8	12.0	13.3	14.8	15.8	16.0	16.3	16.6	15.0	15.2	11.9	10.9	11.9	12.7
AVERAGE POWER,MW	42	28	37	36	40	45	48	48	49	50	49	44	37	33	36	38
PEAK POWER,MW		83	89	88	89	91	92	93	94	95	93	92	88	85	86	86
ENERGY,1000MWH	373.8	4.9	8.2	26.8	30.6	33.6	35.8	36.2	36.8	37.2	14.4	16.1	27.5	23.2	24.9	14.8
MAIN STEM SYSTEM															
REACH INF,1000AF	34468	836	1074	2881	3224	9402	3893	1387	1127	1335	494	494	648	742	1003	992
EVAP,1000 AF	1926	0	0	0	129	75	396	387	284	198	87	86	72	0	0	0
INF ADJ,1000AF	-11448	-89	-119	-489	-1958	-2498	-2900	-1967	-1033	-939	-132	-132	-179	-126	-162	-188
STORAGE,1000AF	92299	91388	90836	91199	92079	95824	94488	93844	91838	91170	90968	90744	90407	90341	90462	90649
AVERAGE POWER,MW	787	378	428	488	584	884	838	887	808	841	803	887	822	889	876	878
PEAK POWER,MW		2217	2215	2219	2216	2227	2225	2227	2220	2219	2212	2203	2217	2219	2219	2219
ENERGY,1000MWH	9149.3	63.0	92.0	349.4	375.9	481.1	479.2	528.7	475.7	497.1	199.4	264.9	493.0	438.3	390.9	230.1
BIG BEND															
REACH INF,1000AF	1543	82	109	273	239	834	186	187	72	48	32	28	31	14	74	93
INF ADJ,1000AF	-191	-2	-3	-19	-81	-71	-27	-13	-5	-2	0	0	0	0	-1	-3
MOD INF,1000AF	1401	79	101	260	203	802	134	89	63	46	32	28	31	14	73	90
FLOW, 1000AF	11496	809	1018	1888	1016	1079	1102	1071	1001	499	472	774	492	715	718	697
FLOW, 1000CFS	19.9	19.1	17.7	17.3	16.9	18.1	17.9	17.4	17.5	17.7	16.9	19.8	12.3	11.1	12.8	19.7
CHAMP															
REACH INF,1000AF	1312	44	86	171	117	196	176	105	87	93	33	34	43	38	76	80
INF ADJ,1000AF	-1076	-18	-24	-66	-184	-164	-240	-199	-116	-29	-15	-15	-16	-15	-32	-41
MOD INF,1000AF	939	25	32	109	13	32	-43	-92	-29	19	18	19	26	22	44	39
FLOW, 1000AF	11731	836	941	1139	1089	1102	1059	980	1003	1005	927	692	798	708	760	688
FLOW, 1000CFS	16.2	17.0	15.1	19.1	18.7	18.9	17.9	15.9	16.9	17.0	17.1	16.9	12.9	11.9	13.8	16.4
WEBSTER CITY															
REACH INF,1000AF	9100	181	827	941	990	823	619	383	320	294	146	146	234	322	317	189
INF ADJ,1000AF	-2378	-73	-99	-299	-298	-393	-313	-189	-149	-131	-42	-42	-65	-89	-129	-86
MOD INF,1000AF	2721	87	132	286	291	430	308	163	151	102	63	63	140	137	187	101
FLOW, 1000AF	18492	324	870	1422	1382	1931	1391	1194	1194	1098	991	976	993	966	966	986
FLOW, 1000CFS	19.9	22.4	22.3	23.9	21.9	20.7	22.1	19.9	19.4	20.9	19.9	19.4	15.2	13.8	16.9	19.7
KANSAS CITY															
REACH INF,1000AF	9699	818	280	935	1048	1435	1457	389	729	980	391	861	382	378	499	281
INF ADJ,1000AF	-3310	-47	-66	-298	-300	-964	-984	-375	-316	-219	-82	-82	-101	-88	-122	-83
MOD INF,1000AF	6348	171	228	681	758	1569	883	394	413	861	378	378	281	290	377	198
FLOW, 1000AF	20801	497	660	3106	2894	2895	2295	1941	1988	1828	779	759	1278	1132	1271	771
FLOW, 1000CFS	28.7	28.8	27.0	39.4	33.1	43.5	34.5	29.1	29.4	28.4	26.1	26.9	19.9	18.4	22.7	25.9
BOONVILLE															
REACH INF,1000AF	9989	189	236	847	710	982	950	282	414	385	193	190	323	312	382	299
INF ADJ,1000AF	-963	-26	-34	-98	-101	-96	-122	-85	-73	-49	-30	-30	-26	-48	-63	-35
MOD INF,1000AF	8021	158	253	794	608	886	837	197	340	335	163	160	297	264	319	264
FLOW, 1000AF	25822	657	893	2869	2649	3240	2683	1740	1909	1936	938	922	1909	1681	1584	980
FLOW, 1000CFS	35.6	47.4	47.8	48.1	43.0	52.9	43.6	28.3	32.1	32.5	31.6	30.0	31.0	29.9	25.8	31.8
HERMANN															
REACH INF,1000AF	11798	359	462	1967	1976	1911	978	986	794	819	356	350	699	821	787	484
INF ADJ,1000AF	-826	-31	-40	-139	-181	-119	-104	-61	-103	-38	-38	-38	-43	-89	-98	-58
MOD INF,1000AF	12973	328	421	1438	1424	1896	874	925	897	716	317	317	632	749	726	371
FLOW, 1000AF	36796	887	1278	4351	4071	4833	3597	2886	2767	2650	1256	1242	2144	2149	2287	1384
FLOW, 1000CFS	50.8	51.1	51.2	70.8	68.2	78.2	57.9	36.9	46.9	43.1	42.3	41.8	34.9	36.0	46.8	45.0

PLATE 14

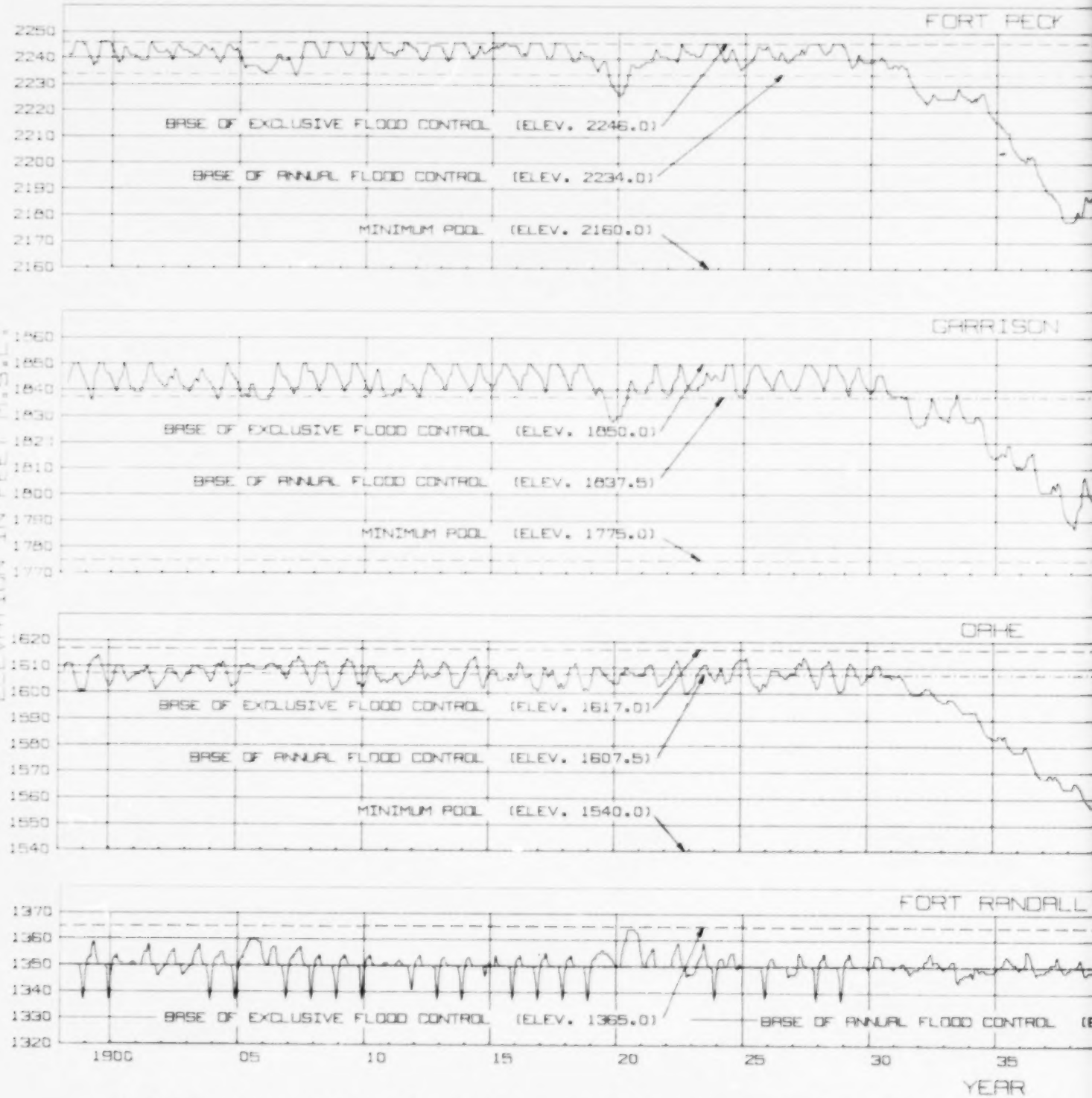


MISSOURI RIVER MAIN STEM RESERVOIR REGULATION

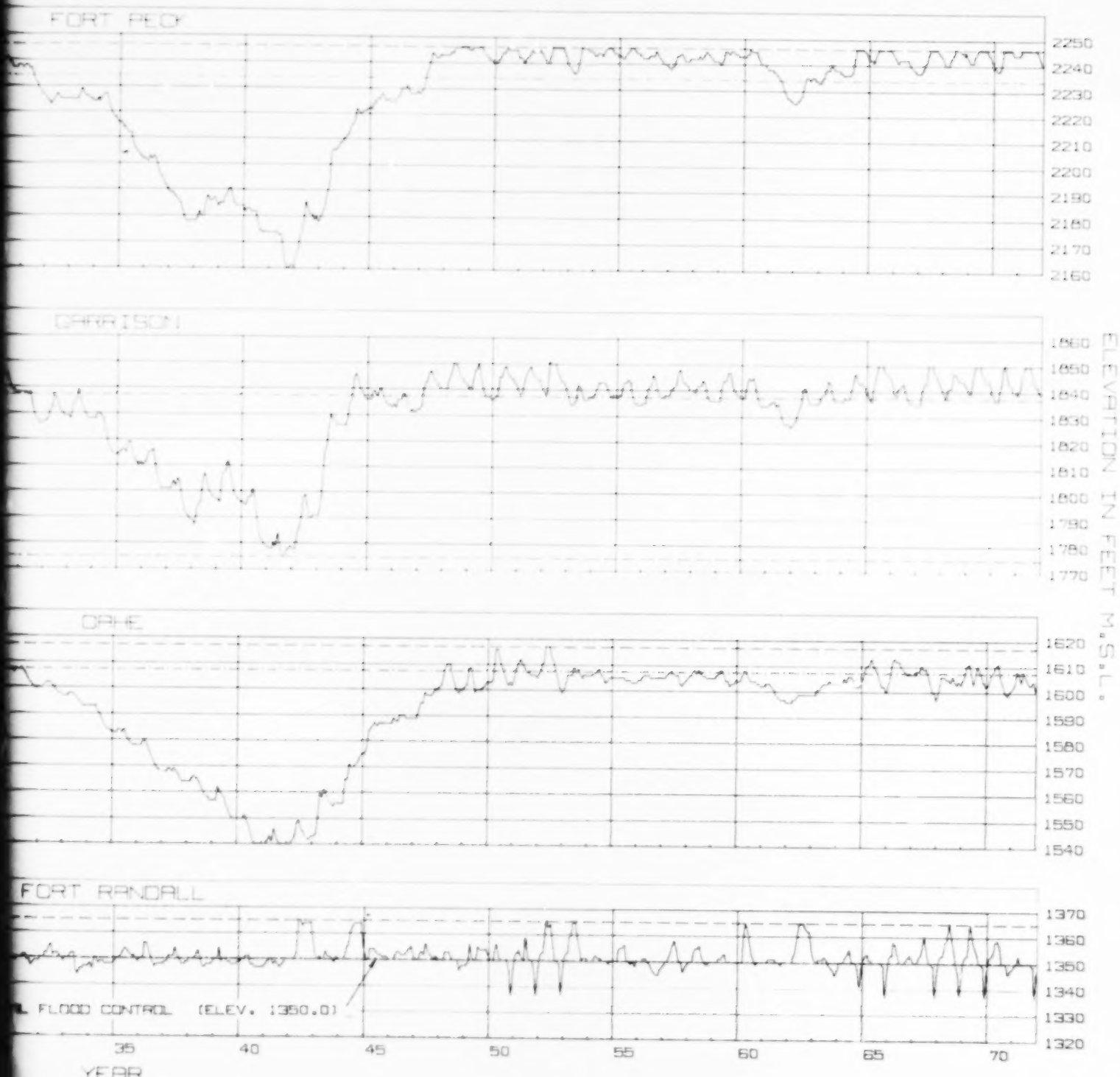


EGULATION, POOL ELEVATIONS, STUDY 1-74-1970

PLATE 15

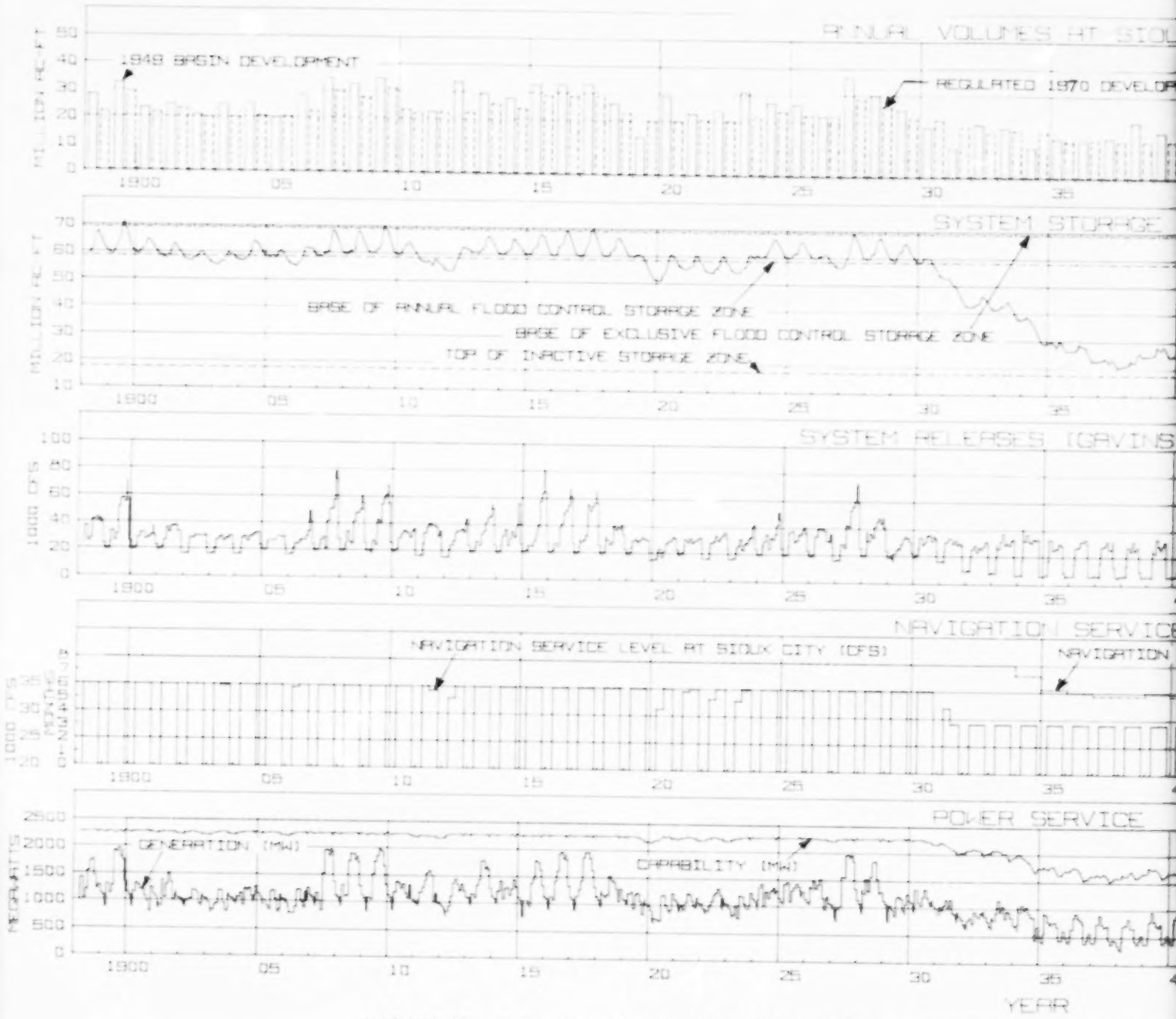


MISSOURI RIVER MAIN STEM RESERVOIR REGULATION.

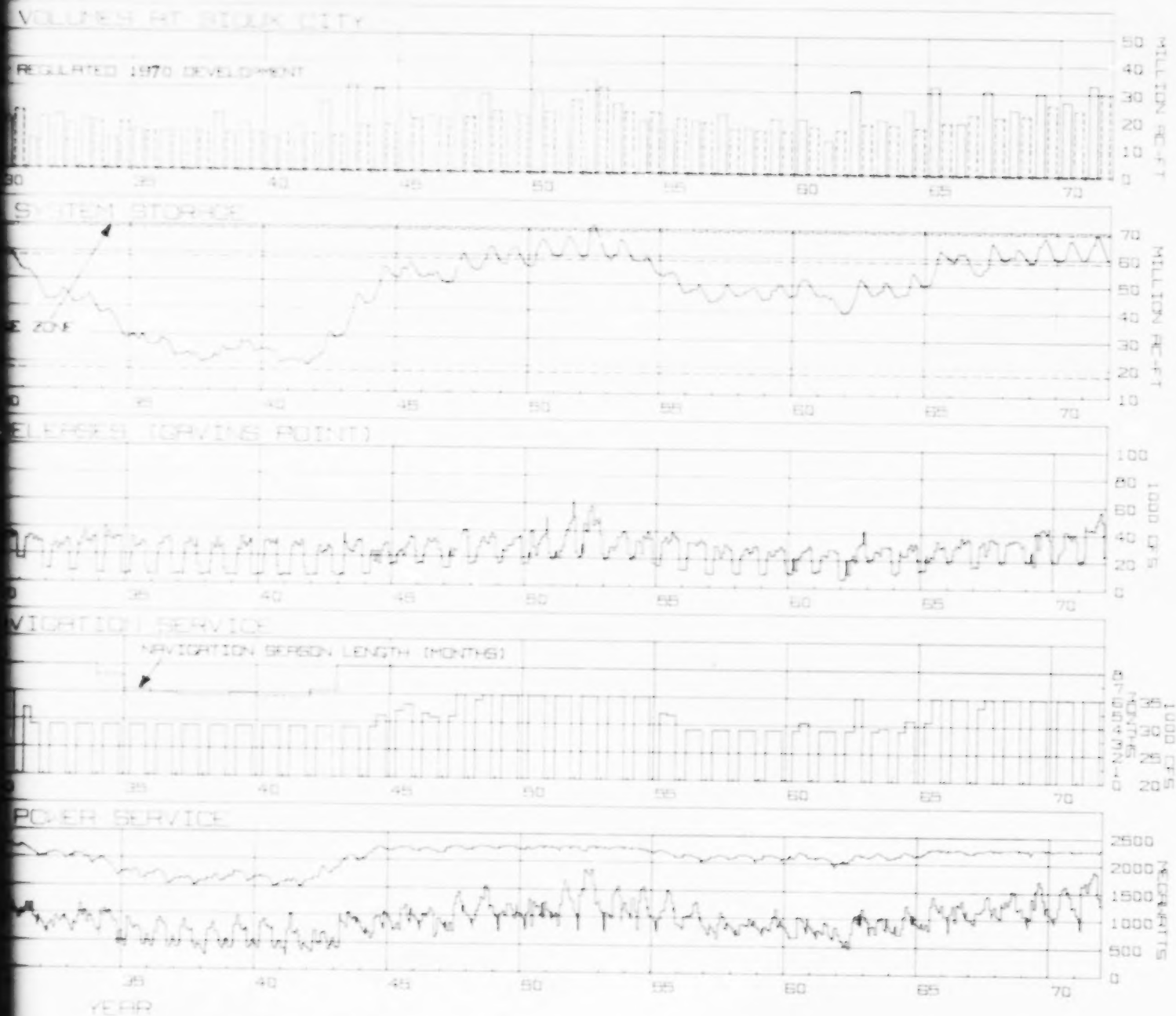


GULATION, POOL ELEVATIONS, STUDY 1-74-MAX-ULT

PLATE 16

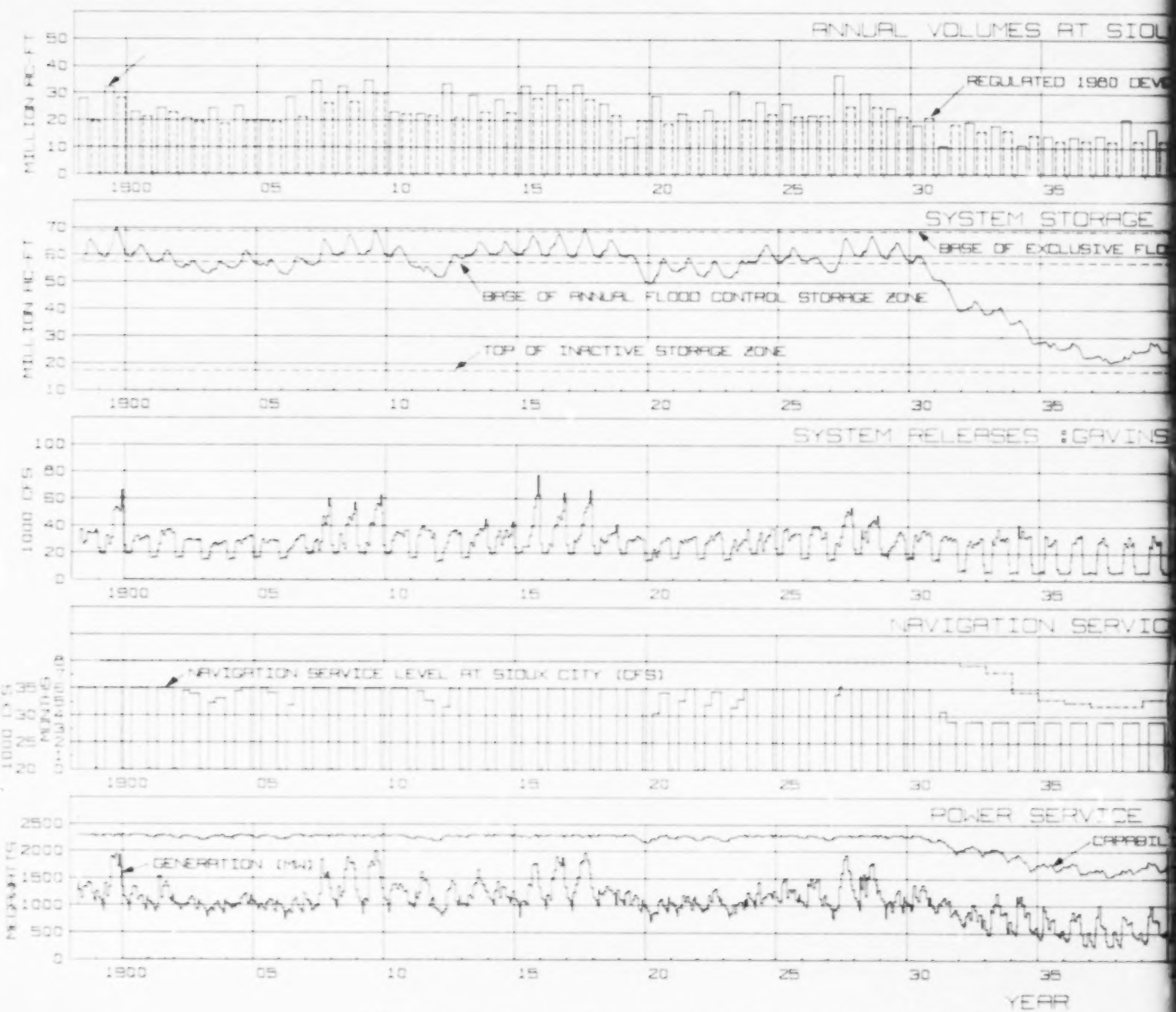


MISSOURI RIVER MAIN STEM RESERVOIR OPE

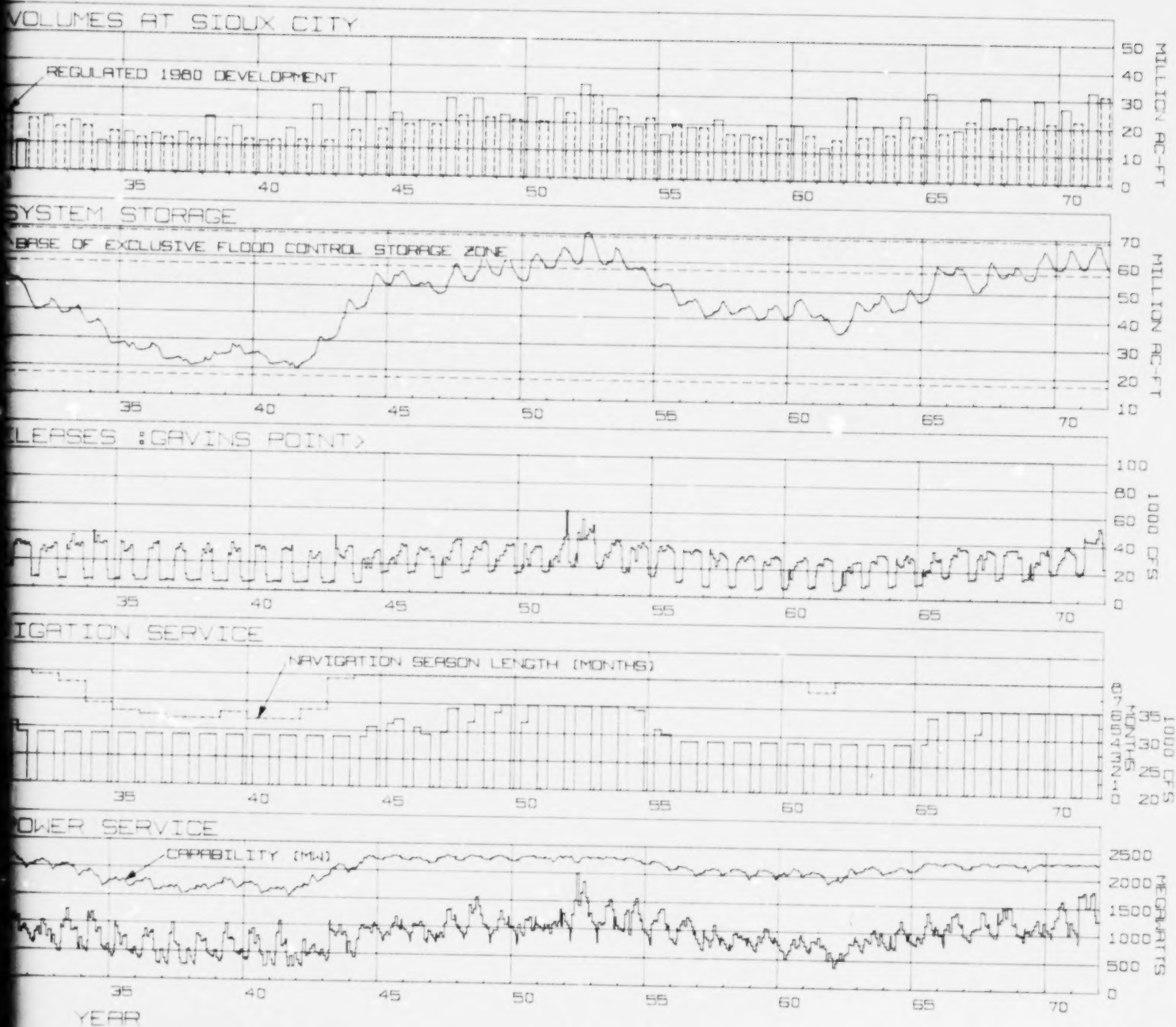


RESERVOIR OPERATIONS, STUDY 1-74-1970

PLATE 17

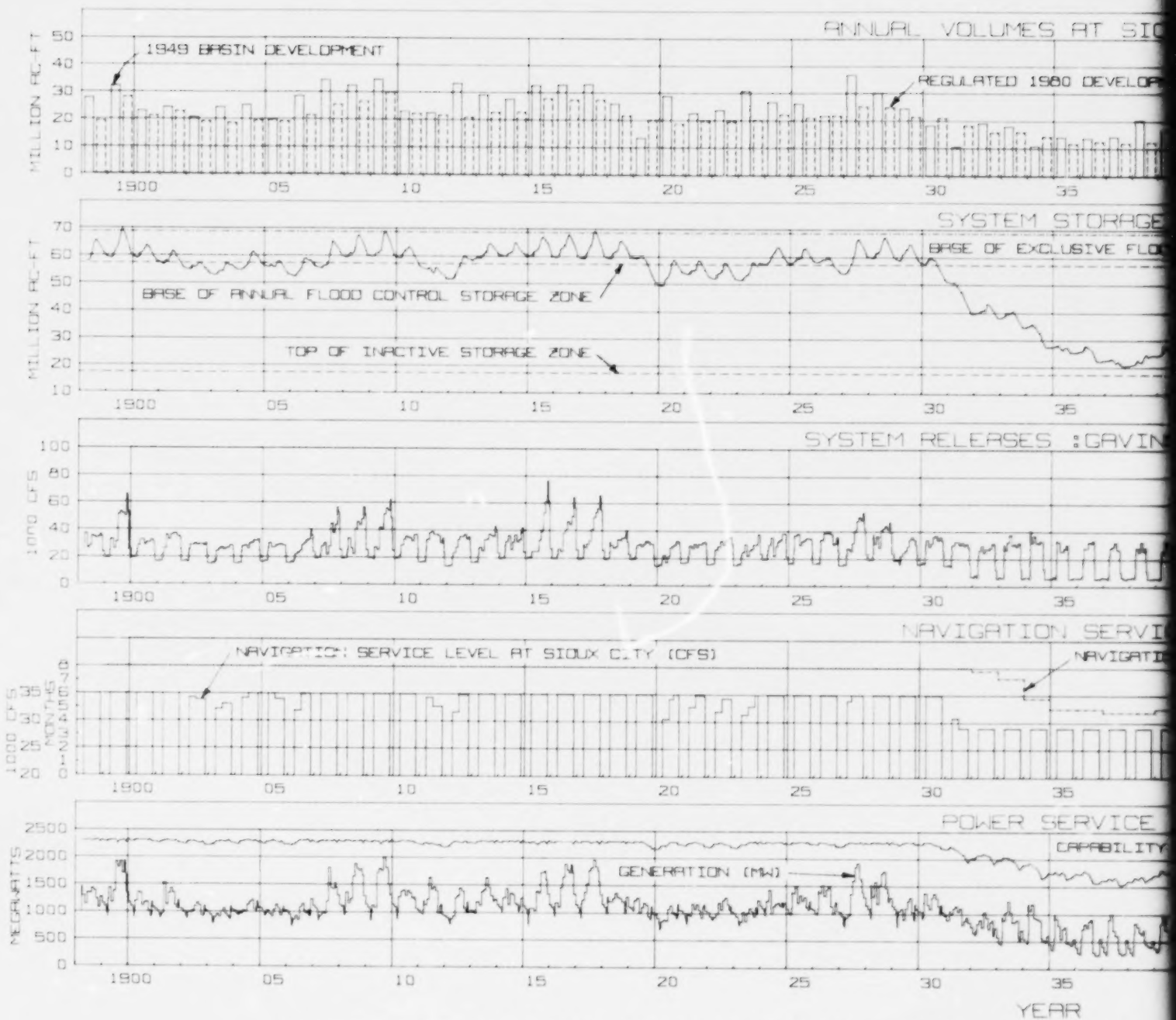


MISSOURI RIVER MAIN STEM RESERVOIR OP

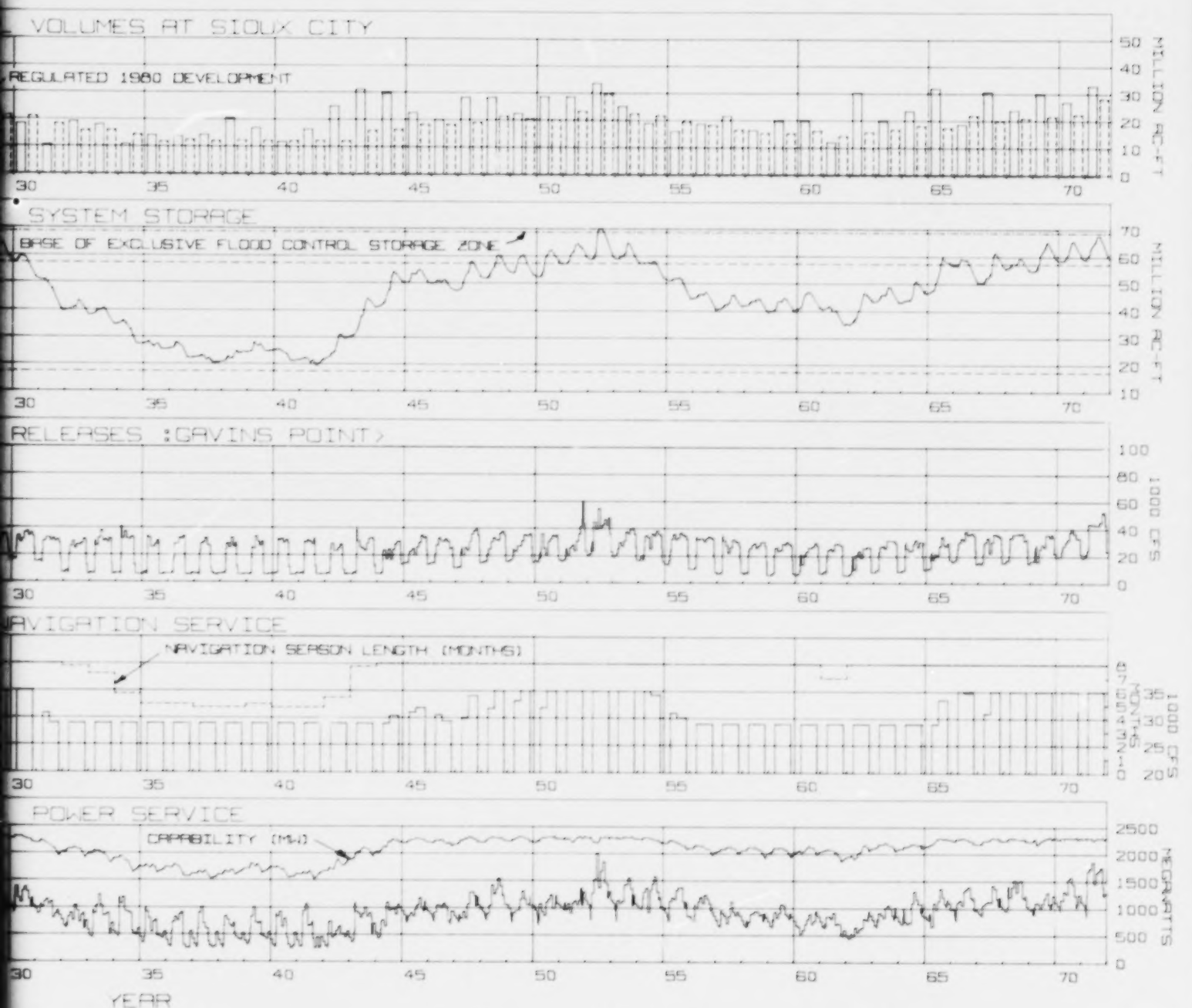


SERVOIR OPERATIONS, STUDY 1-74-1980

PLATE 18

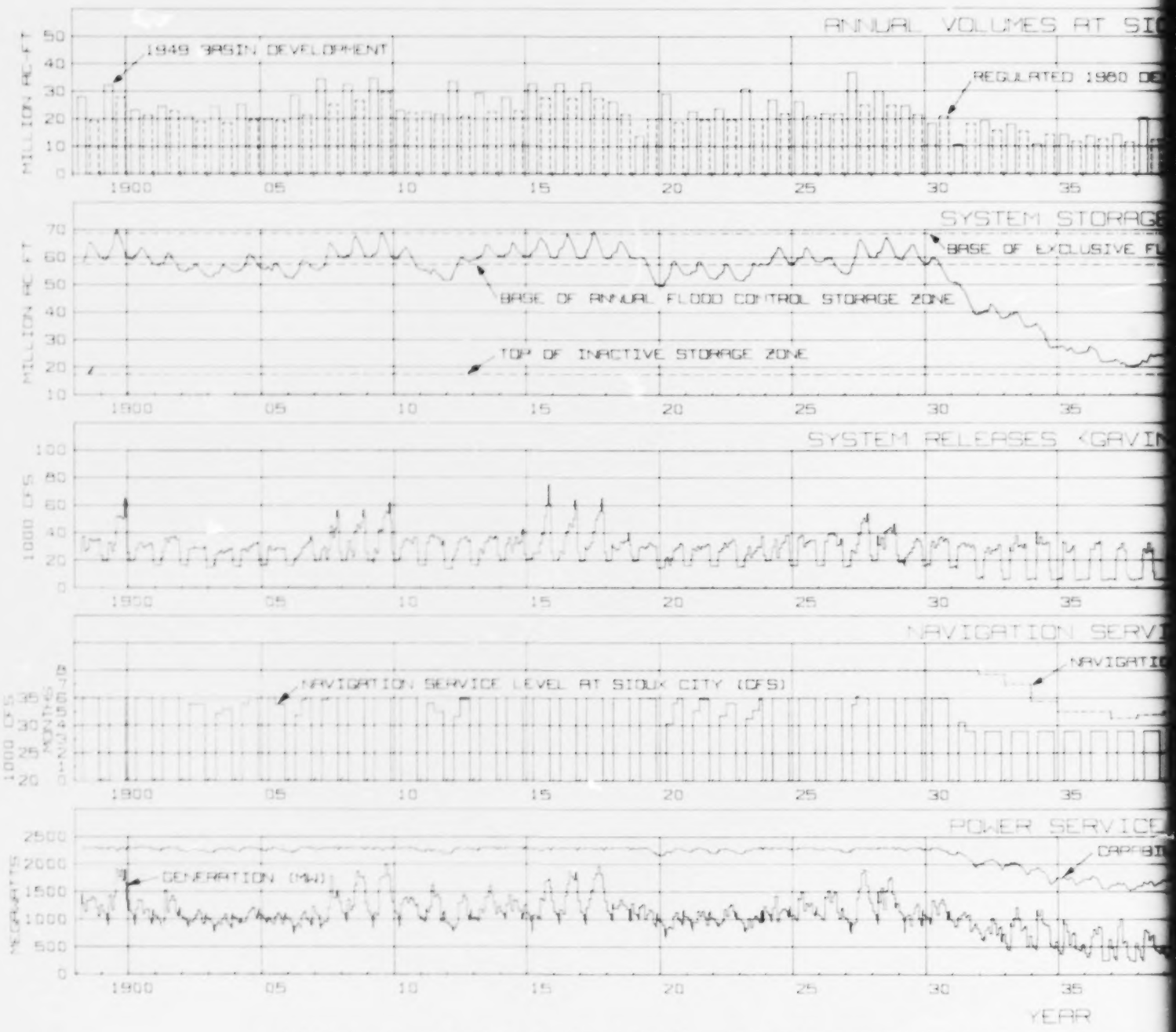


MISSOURI RIVER MAIN STEM RESERVOIR OPERAT

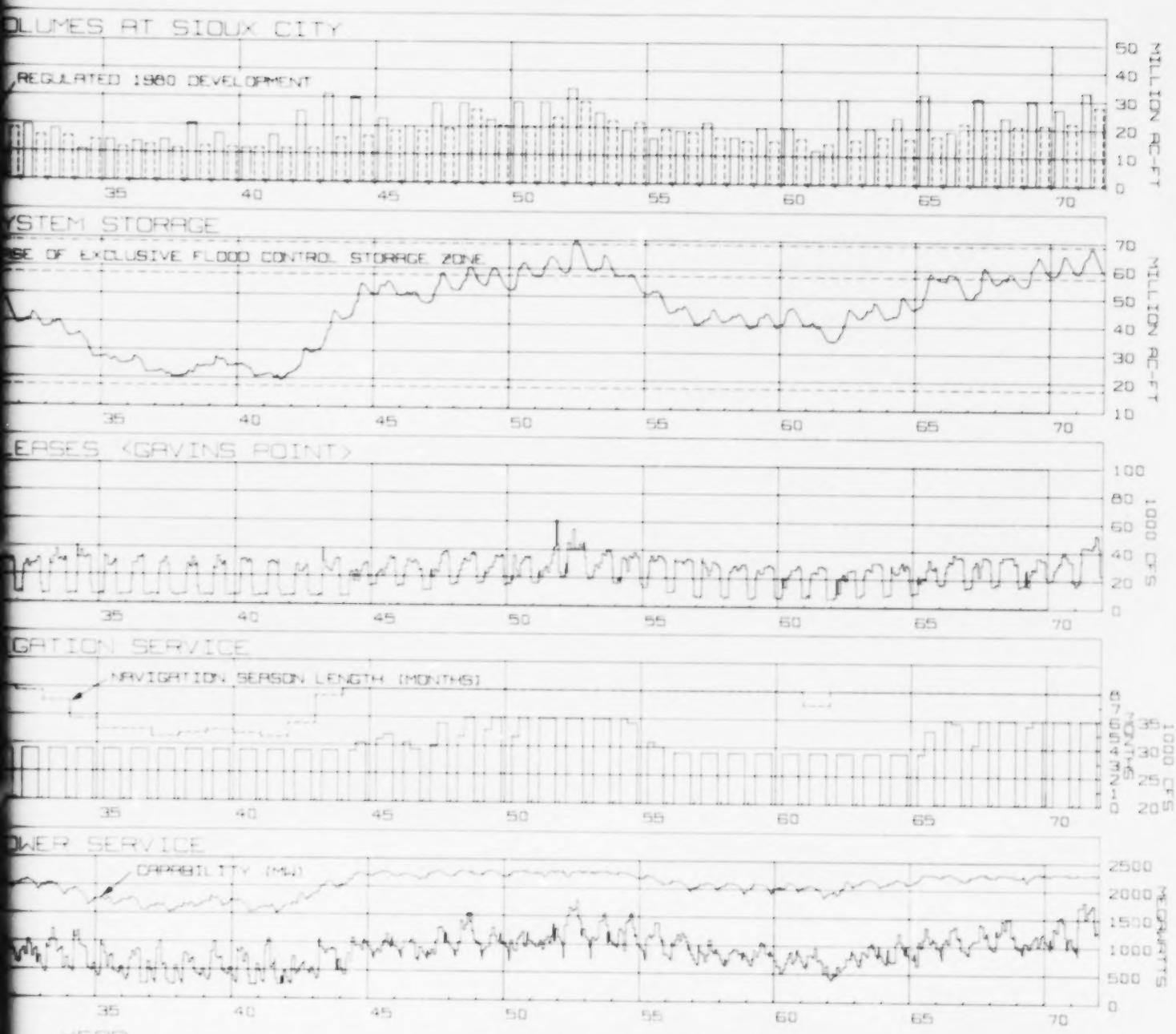


RVOIR OPERATIONS, STUDY 1-74-1980, D 700

PLATE 19

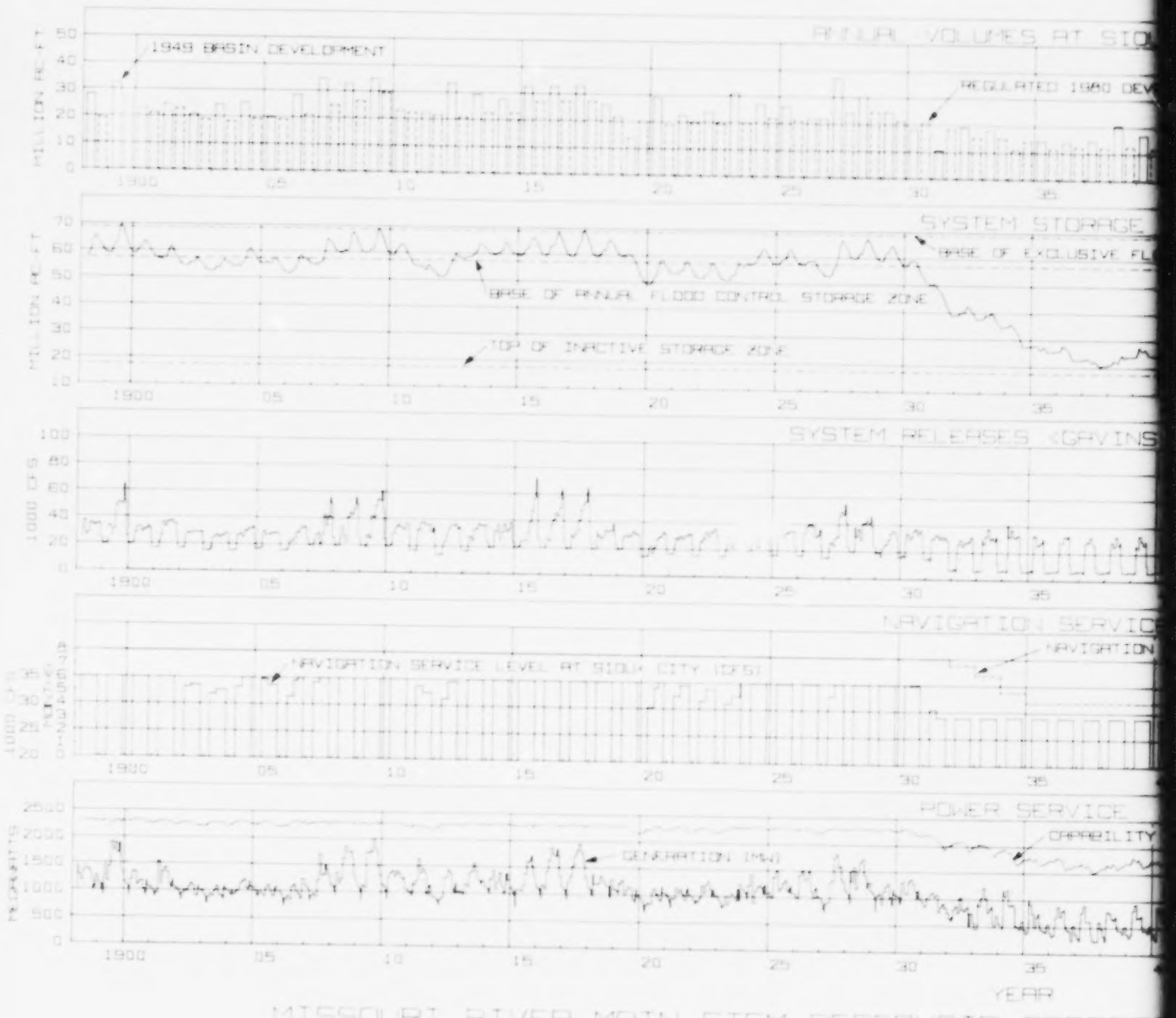


MISSOURI RIVER MAIN STEM RESERVOIR OPERA

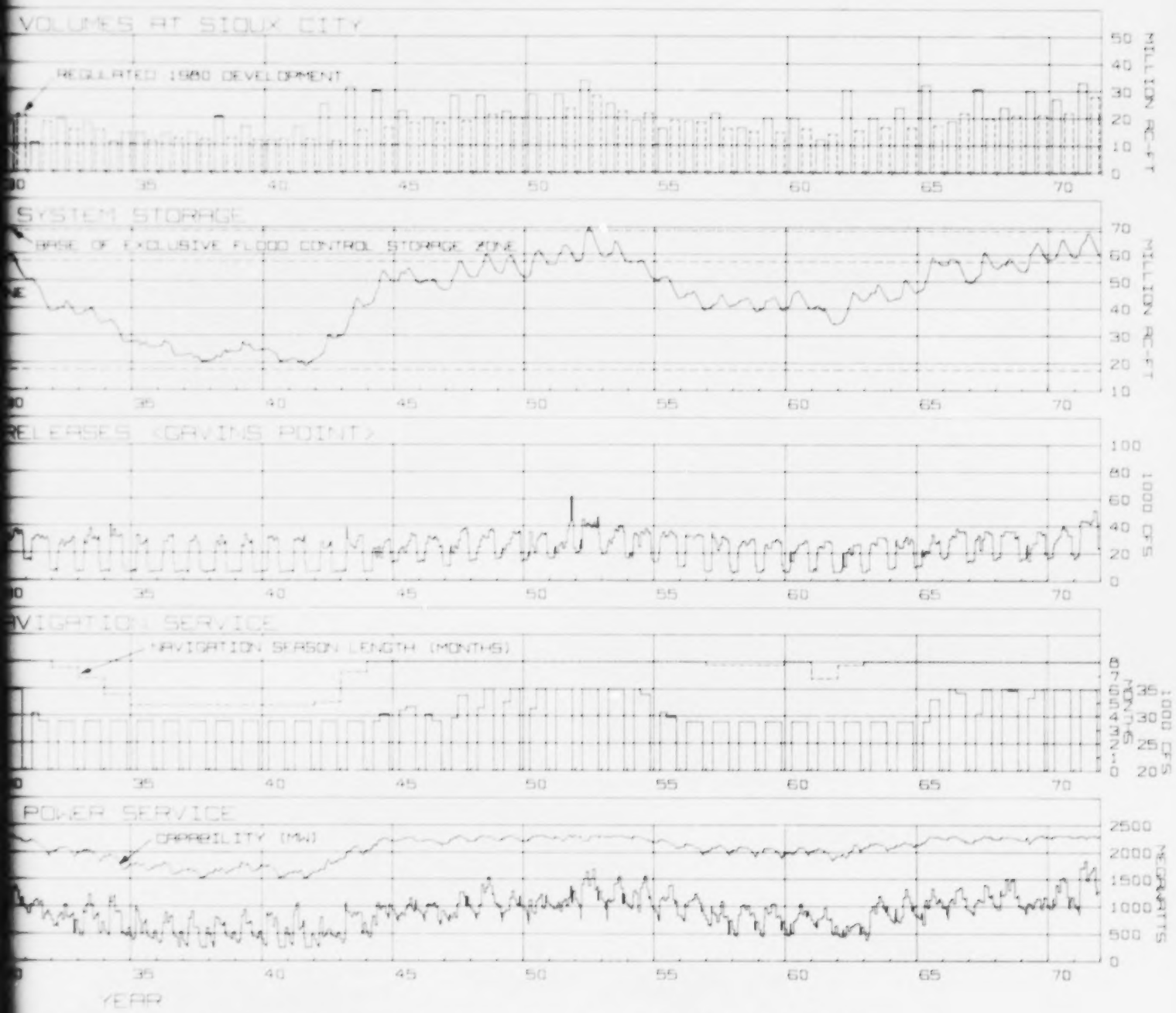


DIP OPERATIONS, STUDY 1-74-1980, D 1400

PLATE 20

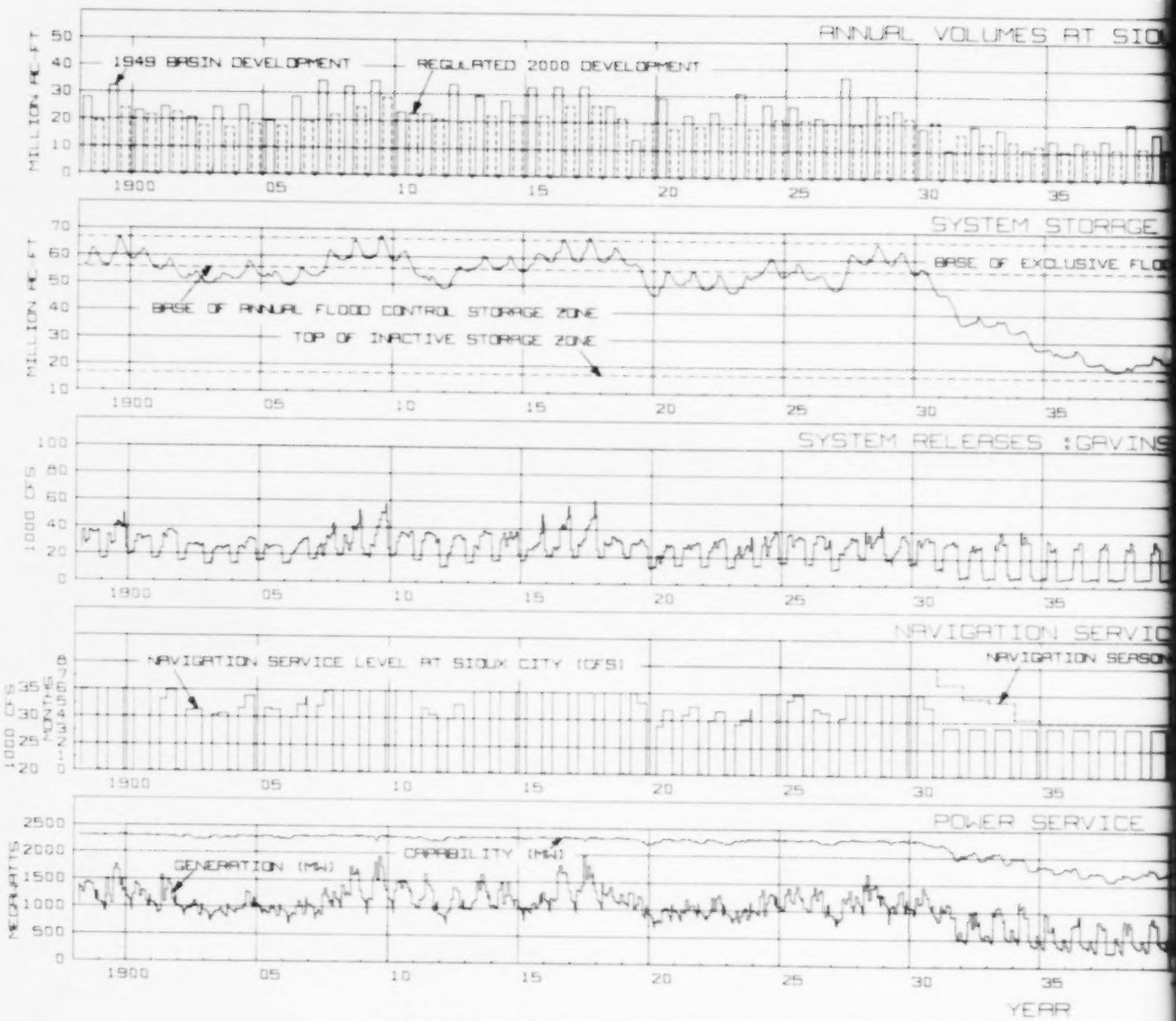

1949 BASIN DEVELOPMENT
REGULATED 1980 DEV
BASE OF EXCLUSIVE FL
BASE OF ANNUAL FLOOD CONTROL STORAGE ZONE
TOP OF INACTIVE STORAGE ZONE
NAVIGATION SERVICE LEVEL AT SIOUX CITY (CFS)
GENERATION (MW)
YEAR

MISSOURI RIVER MAIN STEM RESERVOIR OPERATI

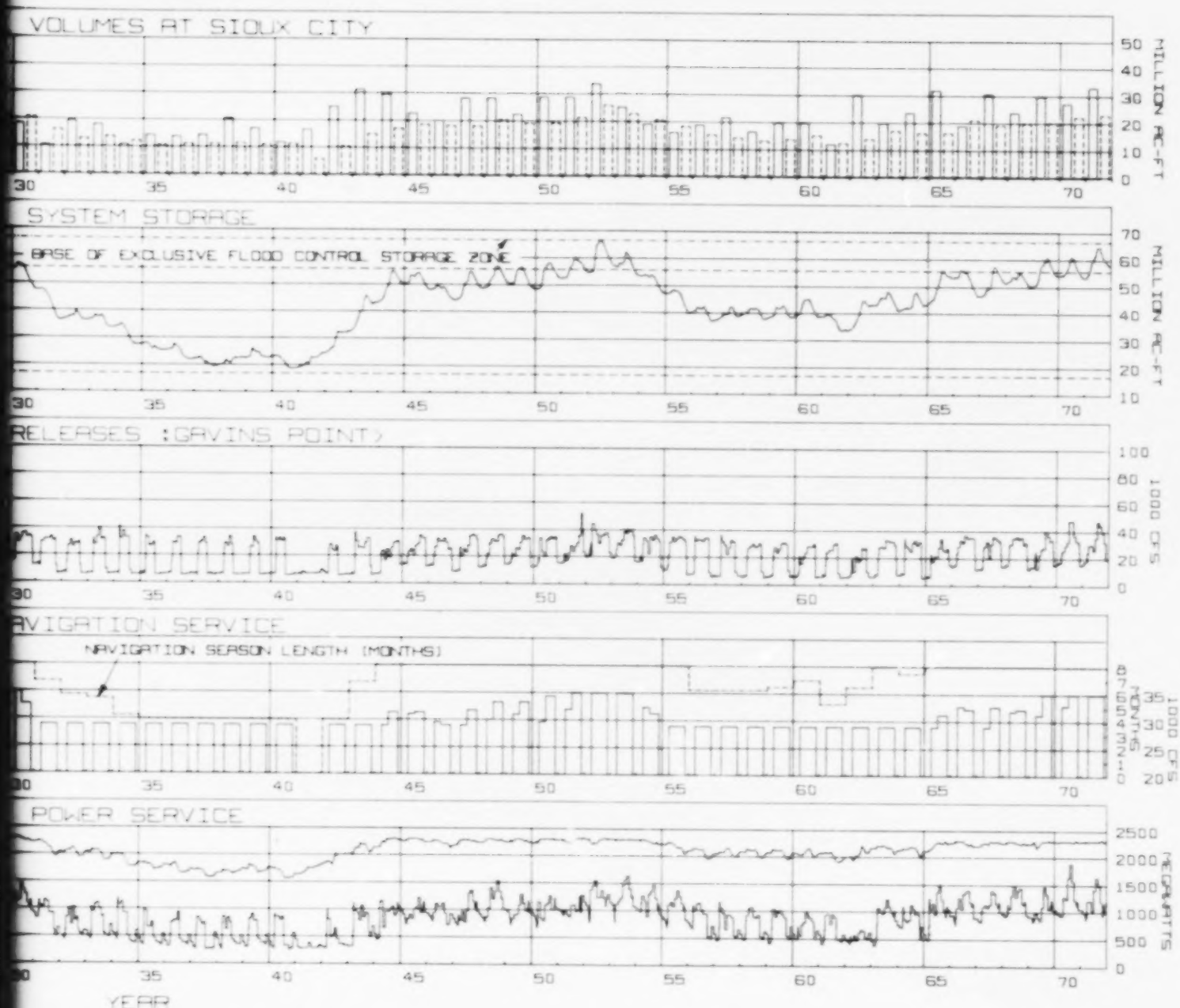


RVOIR OPERATIONS, STUDY 1-74-1980, D 3000

PLATE 21

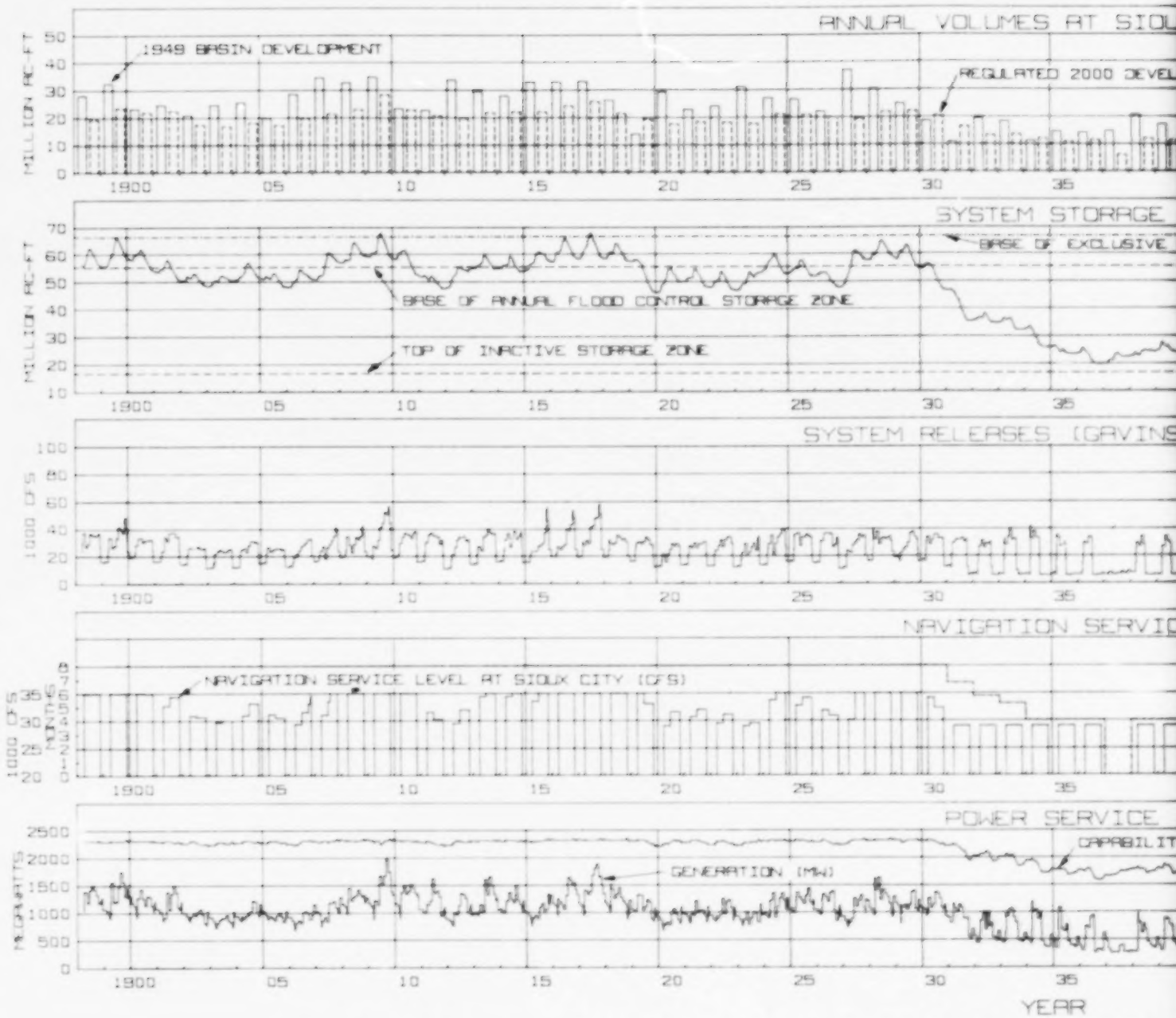


MISSOURI RIVER MAIN STEM RESERVOIR OP

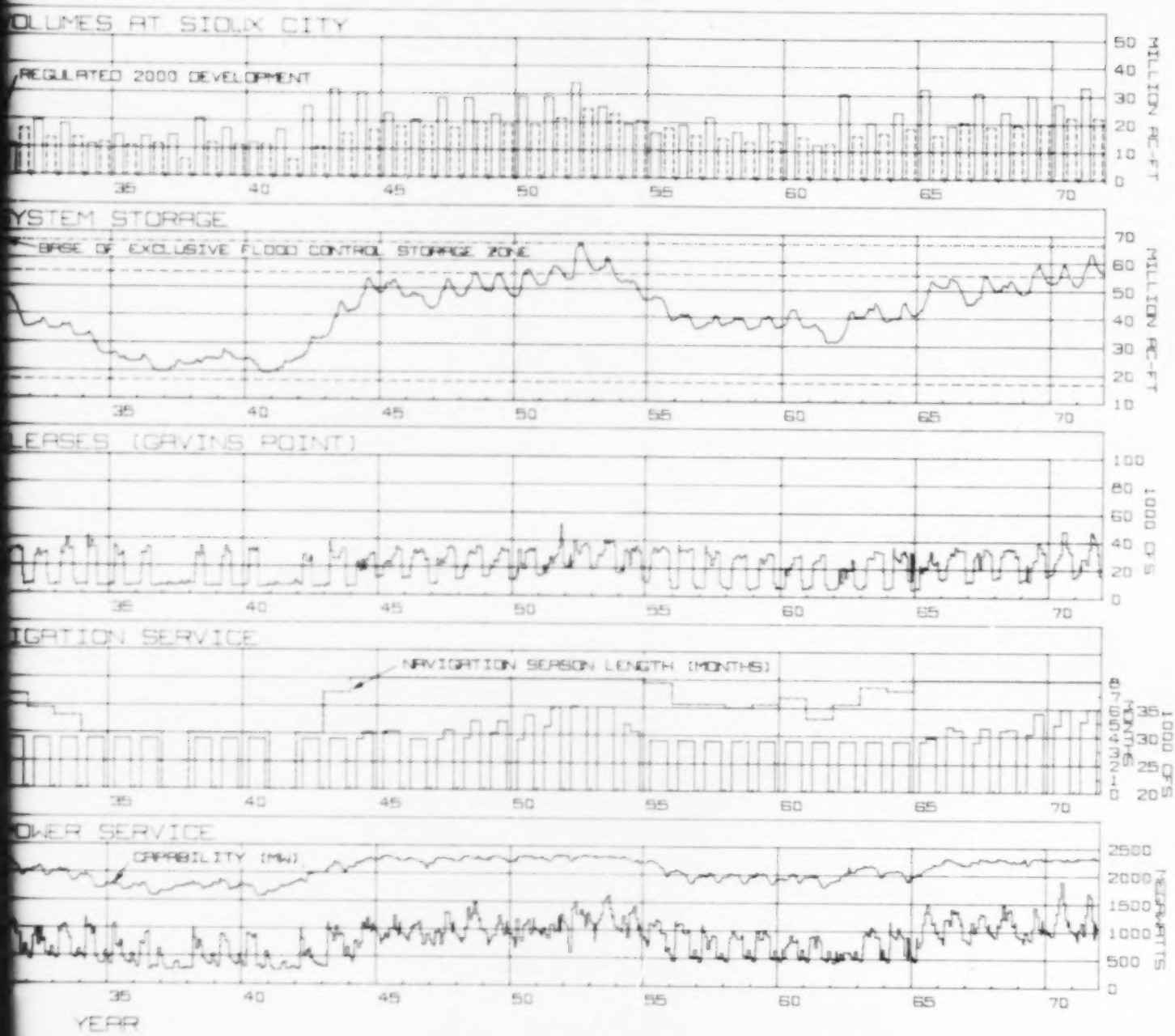


RESERVOIR OPERATIONS, STUDY 1-74-2000

PLATE 22

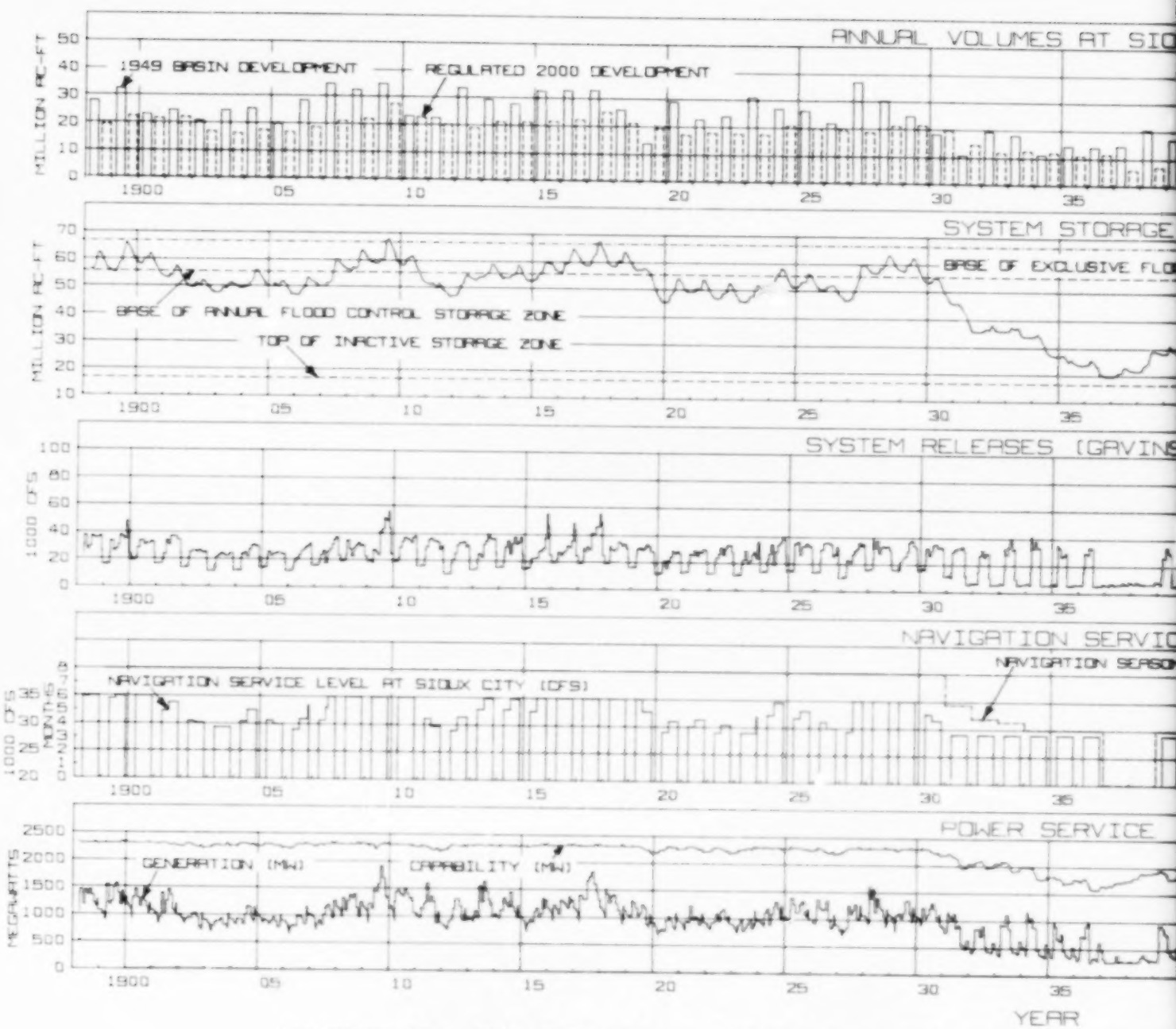


MISSOURI RIVER MAIN STEM RESERVOIR OPERAT

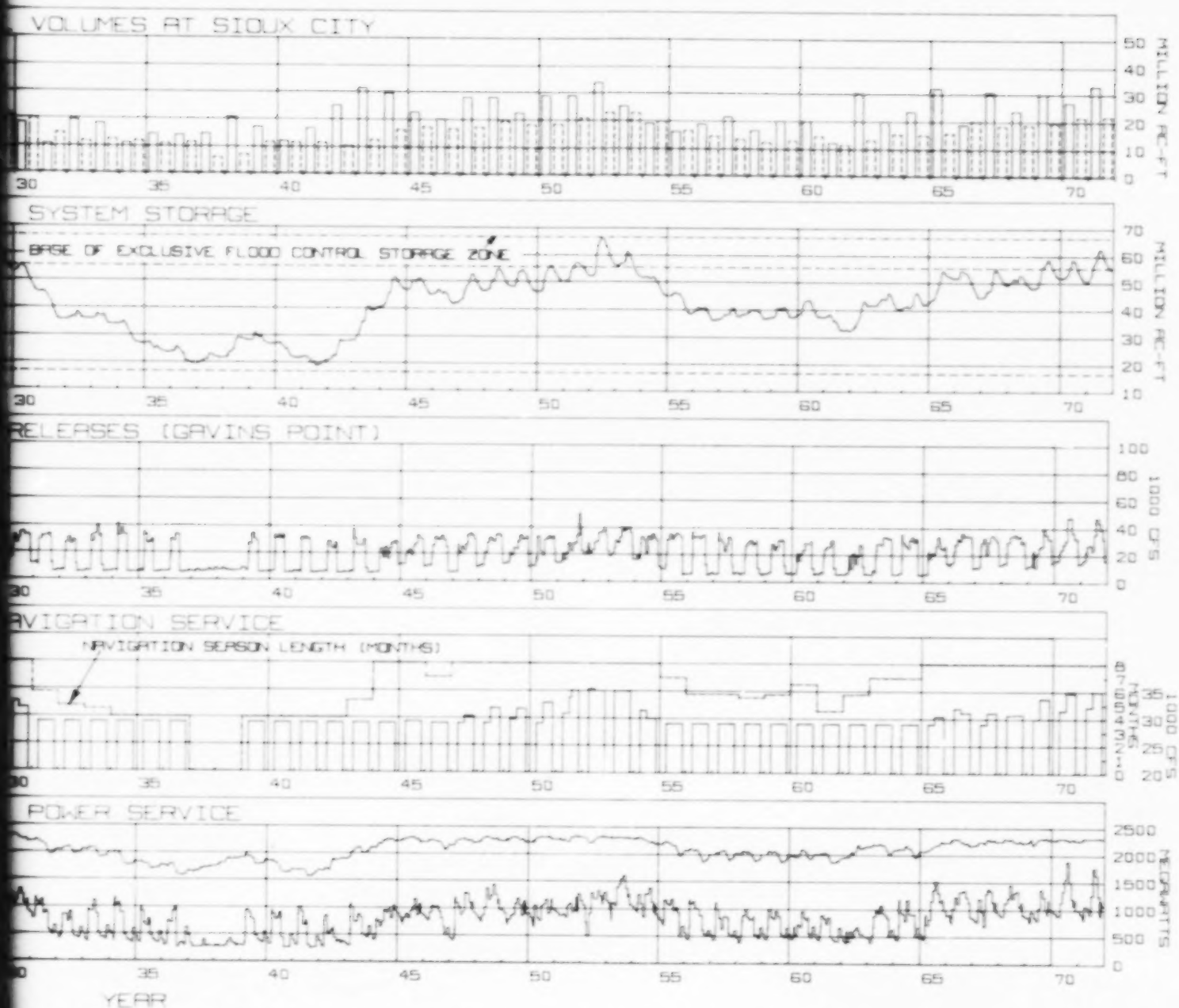


OIR OPERATIONS, STUDY 1-74-2000, D 700

PLATE 23

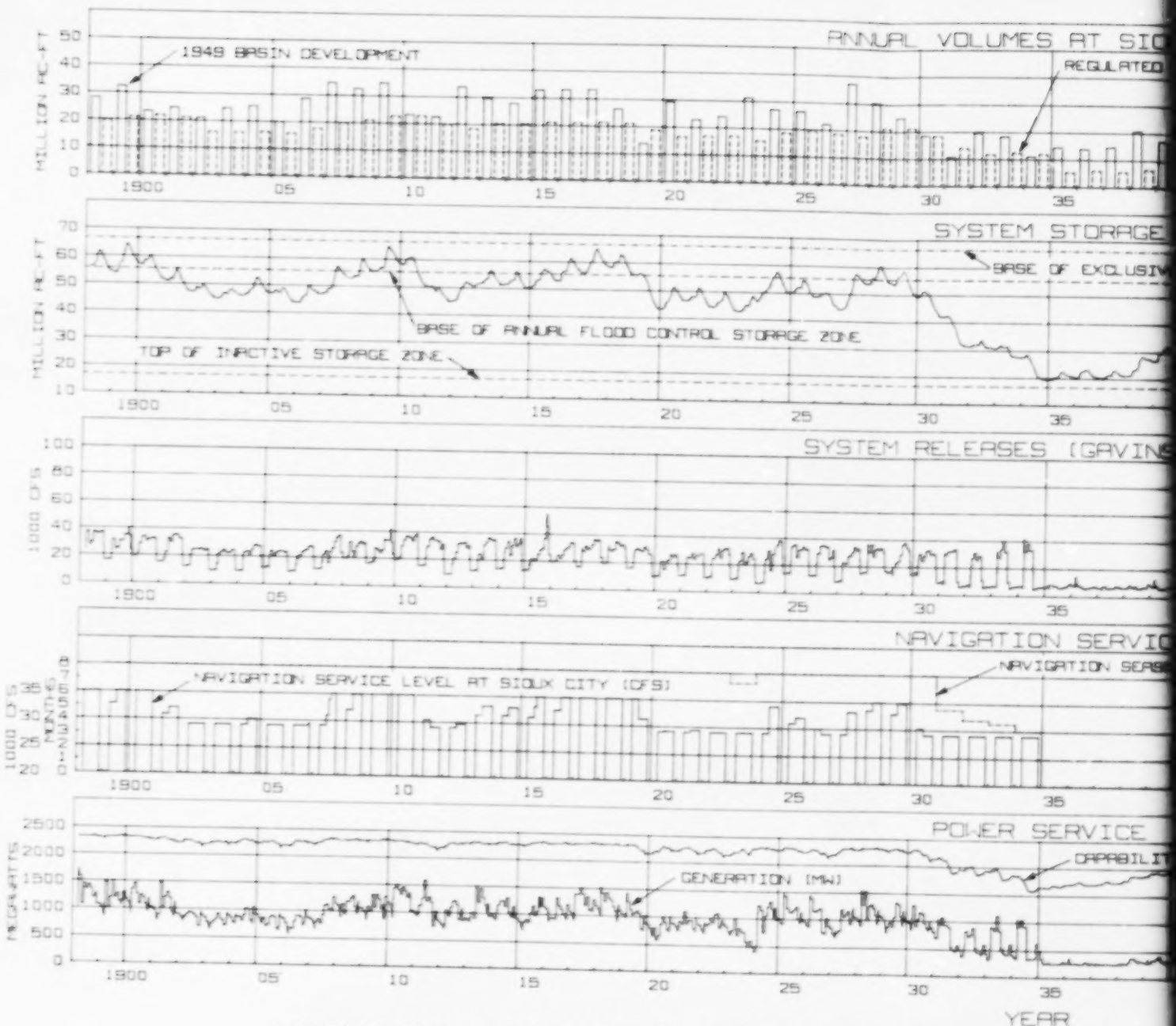


MISSOURI RIVER MAIN STEM RESERVOIR OPERAT

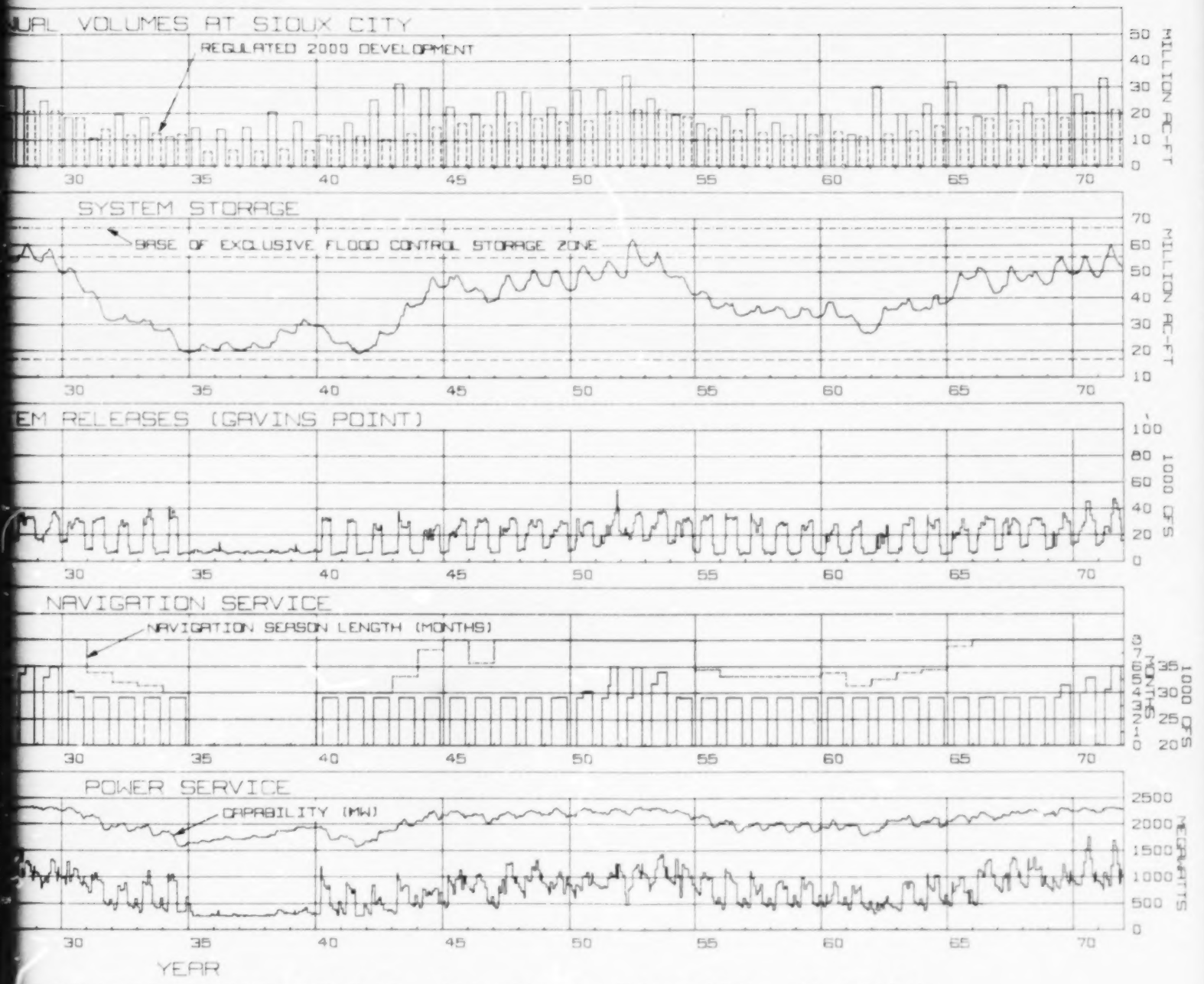


RVOIR OPERATIONS, STUDY 1-74-2000, D 1400

PLATE 24

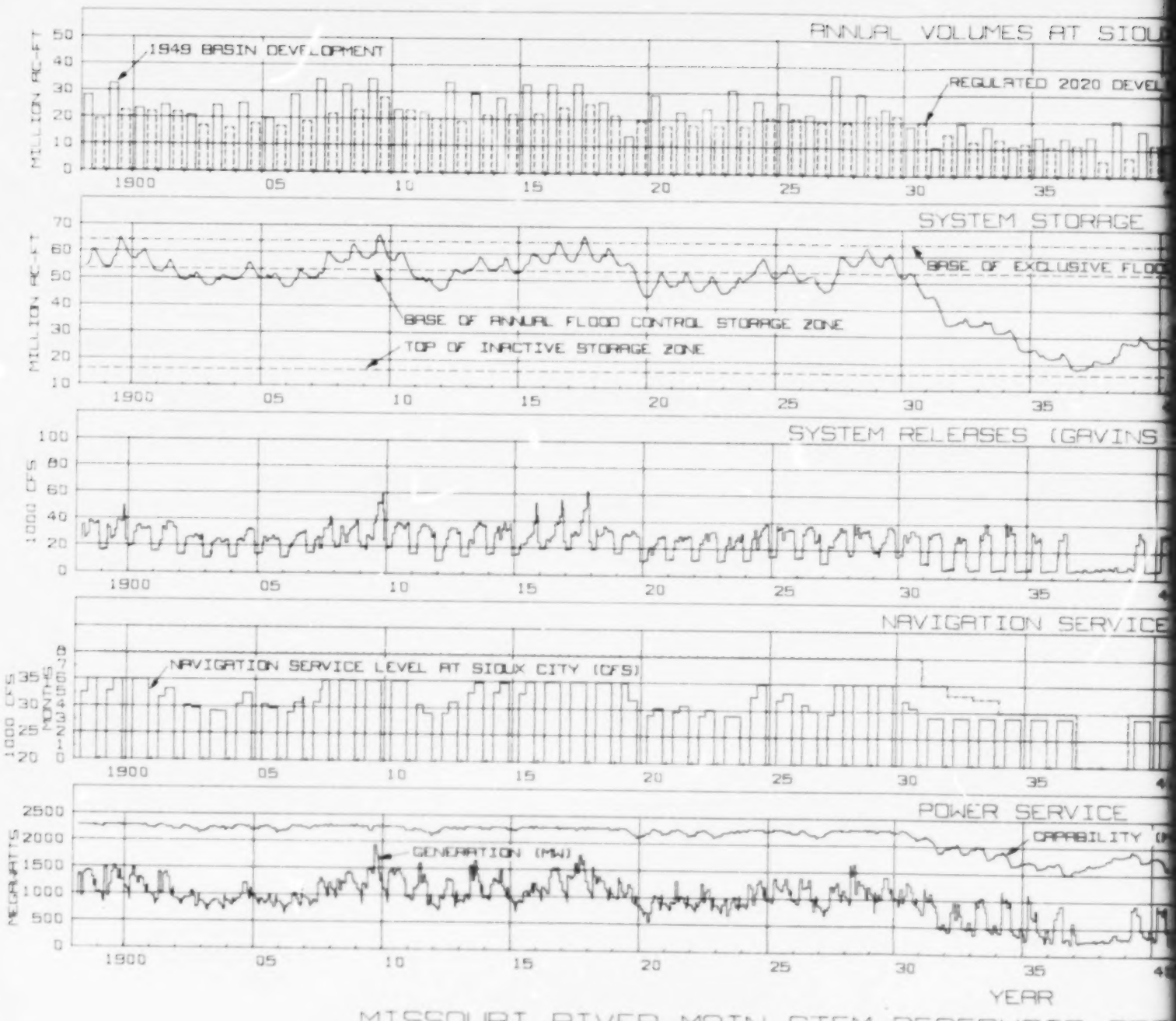


MISSOURI RIVER MAIN STEM RESERVOIR OPERAT

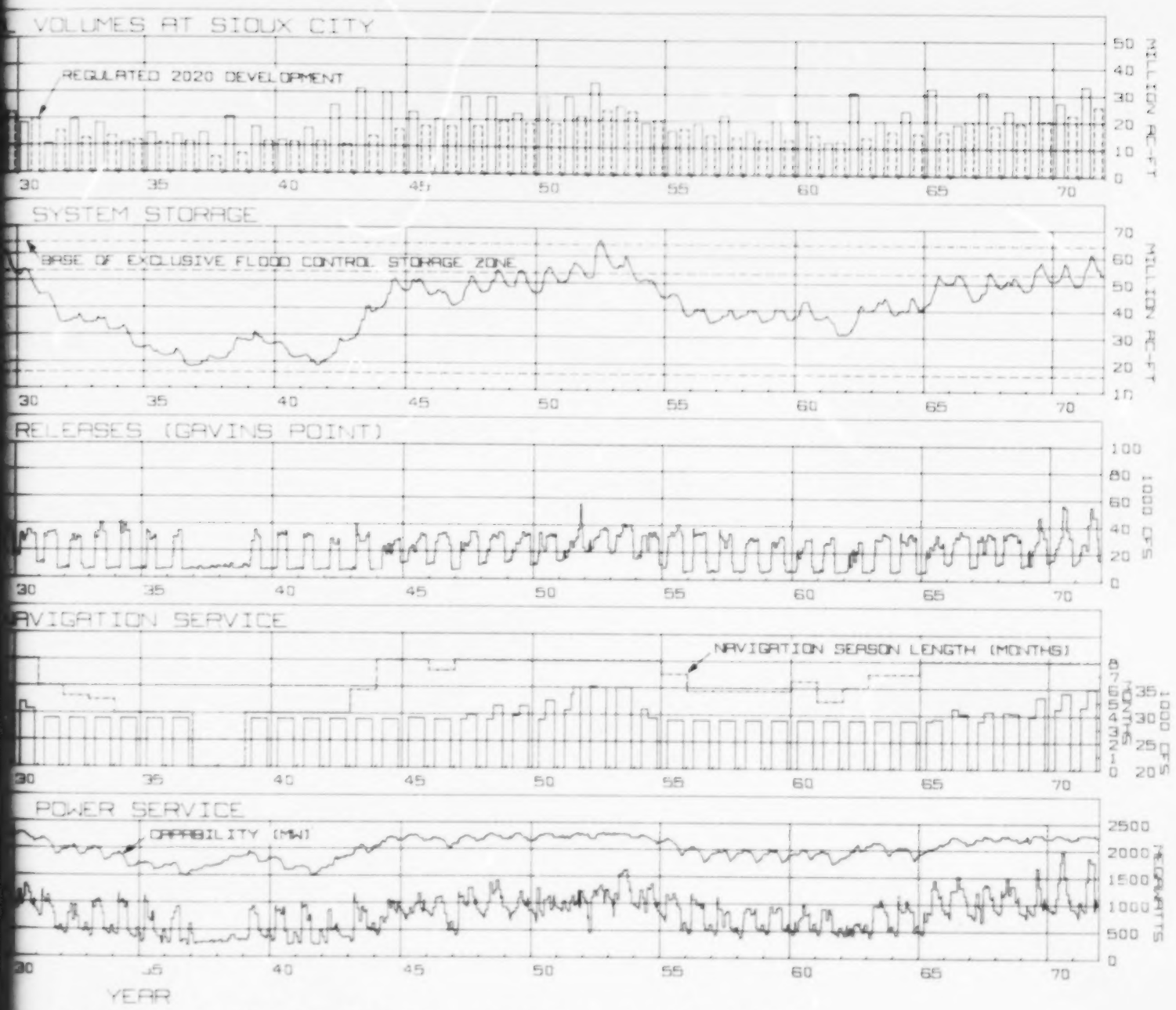


SERVOIR OPERATIONS, STUDY 1-74-2000, D 3000

PLATE 25

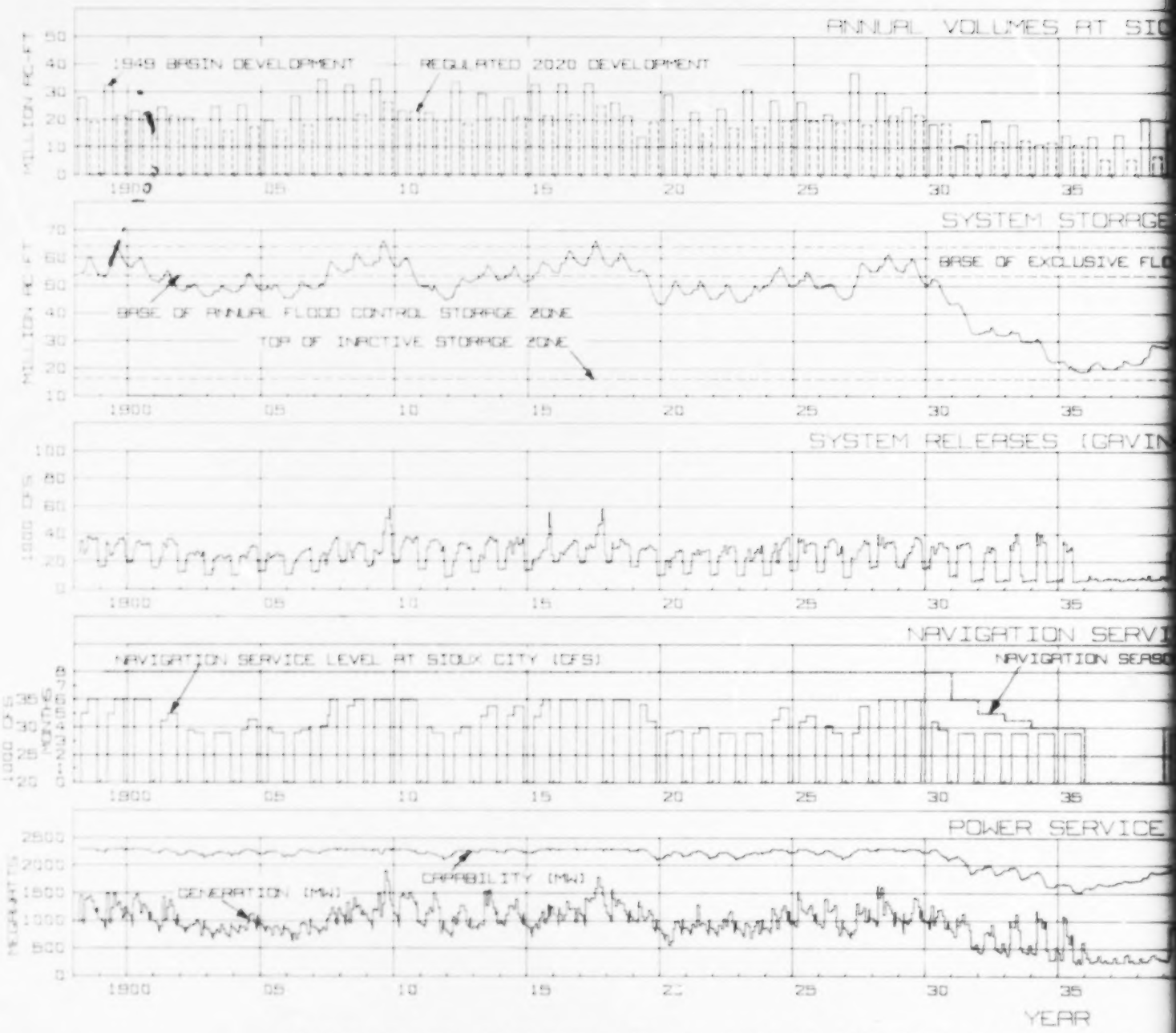


MISSOURI RIVER MAIN STEM RESERVOIR OPE

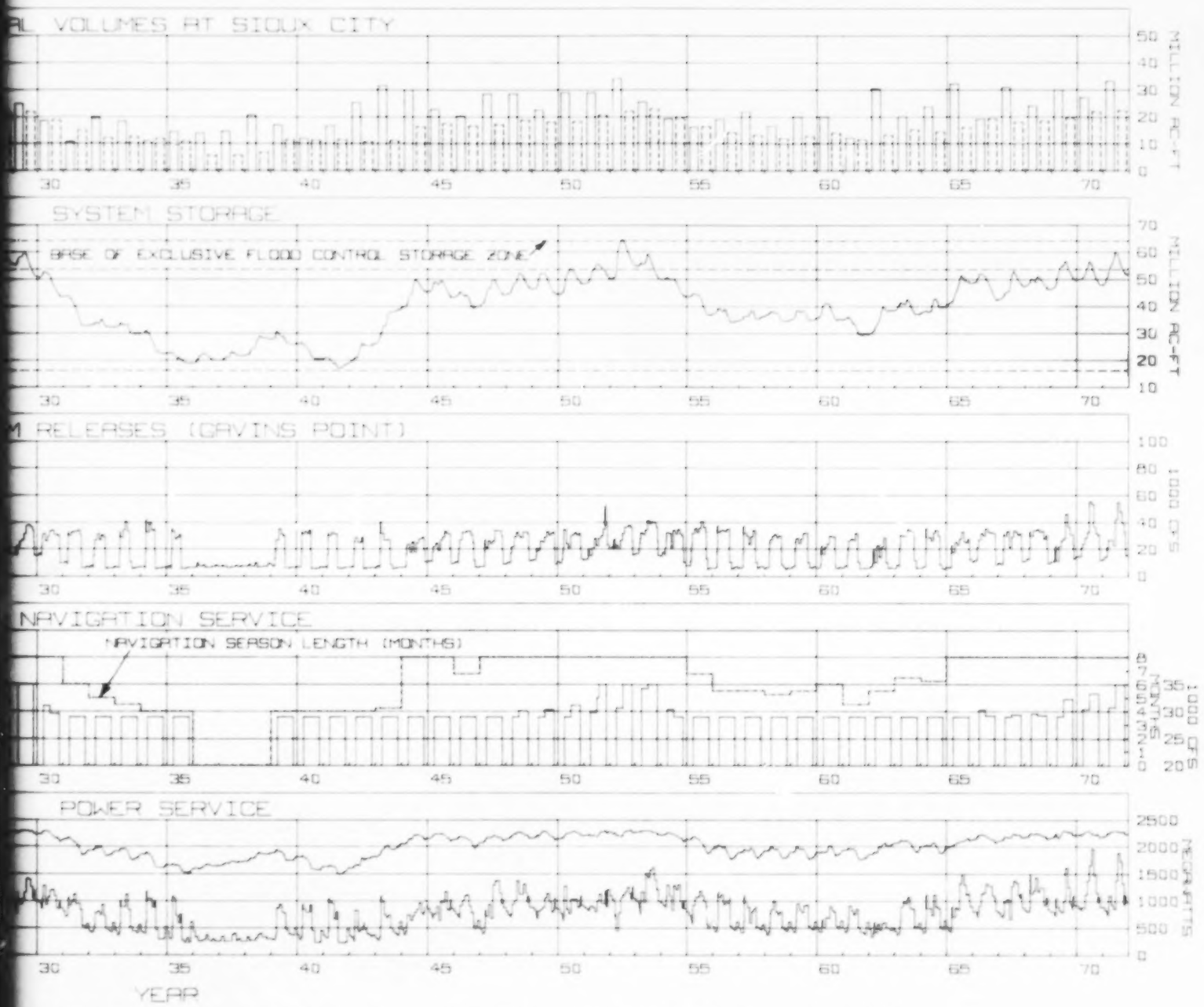


RESERVOIR OPERATIONS, STUDY 1-74-2020

PLATE 26

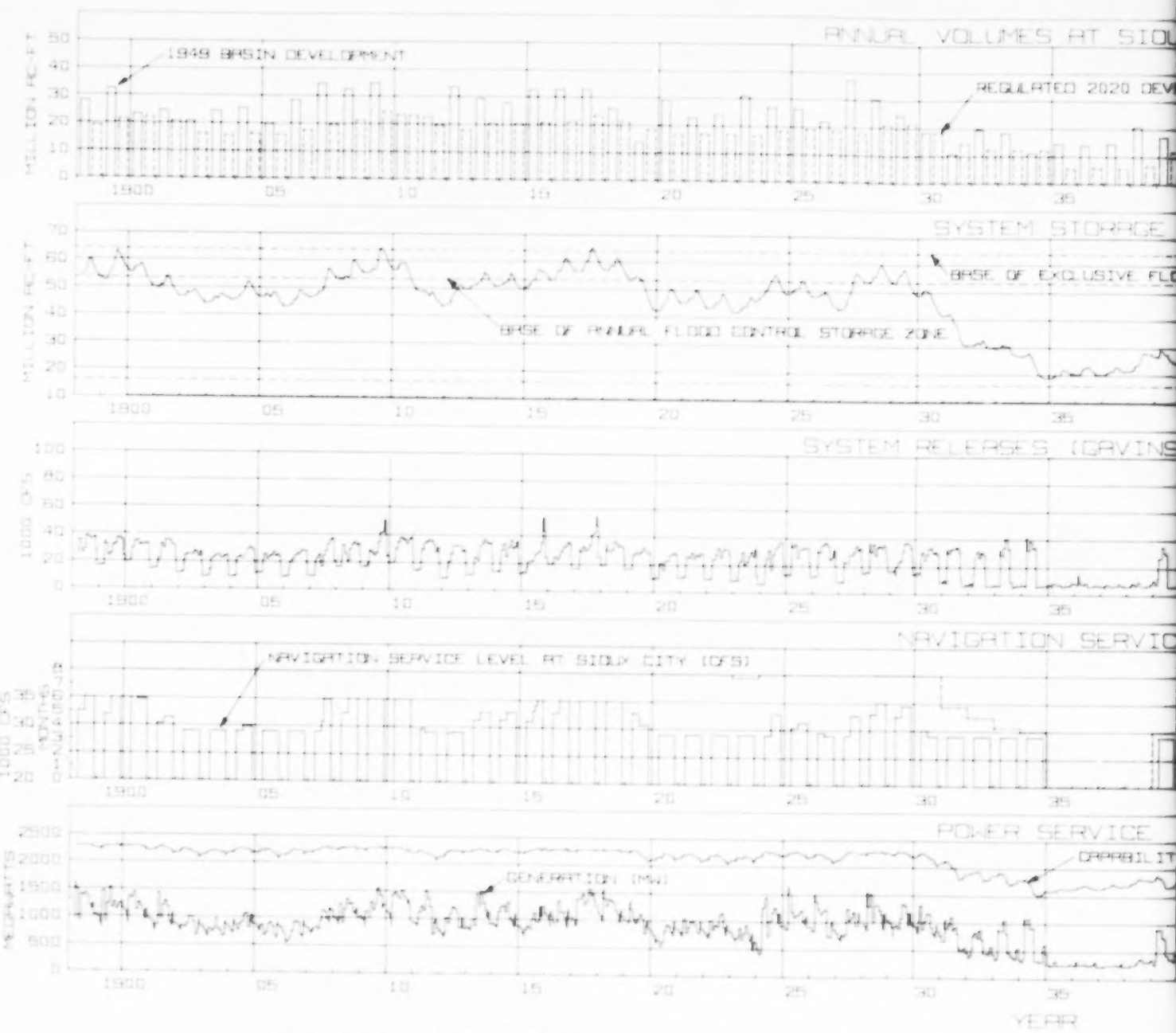


MISSOURI RIVER MAIN STEM RESERVOIR OPERA

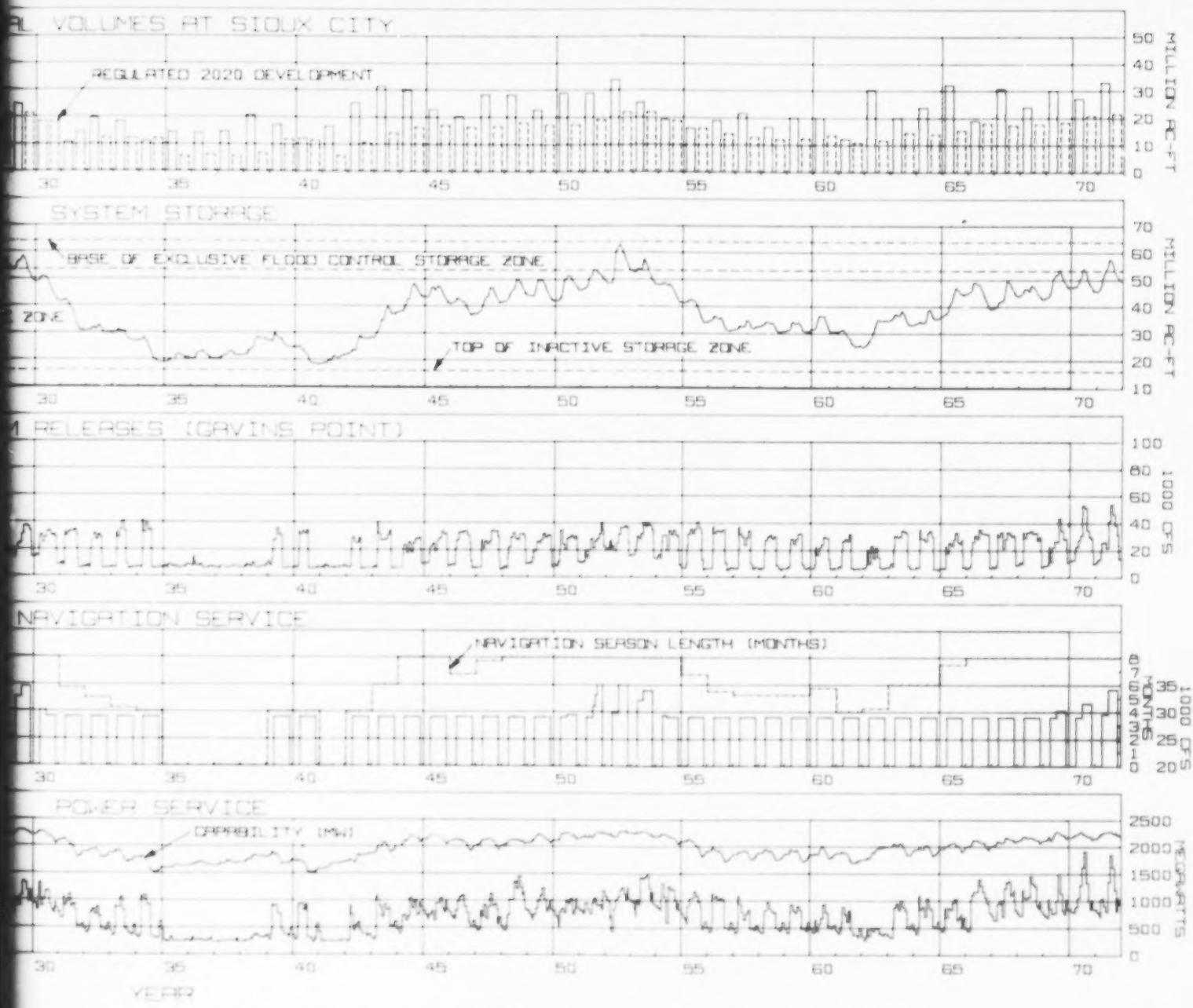


ERVOIR OPERATIONS, STUDY 1-74-2020, D 700

PLATE 27

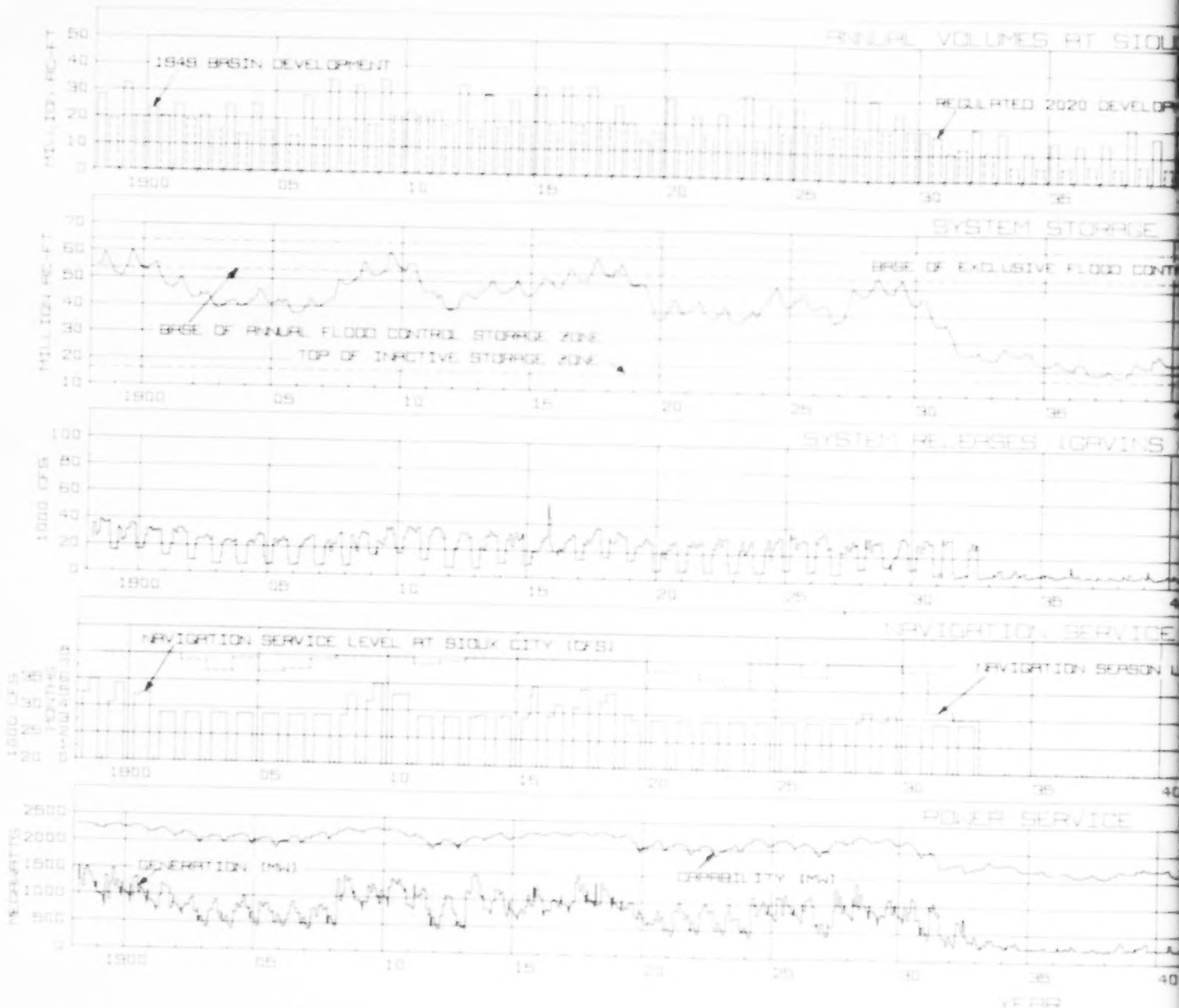


MISSOURI RIVER MAIN STEM RESERVOIR OPERAT

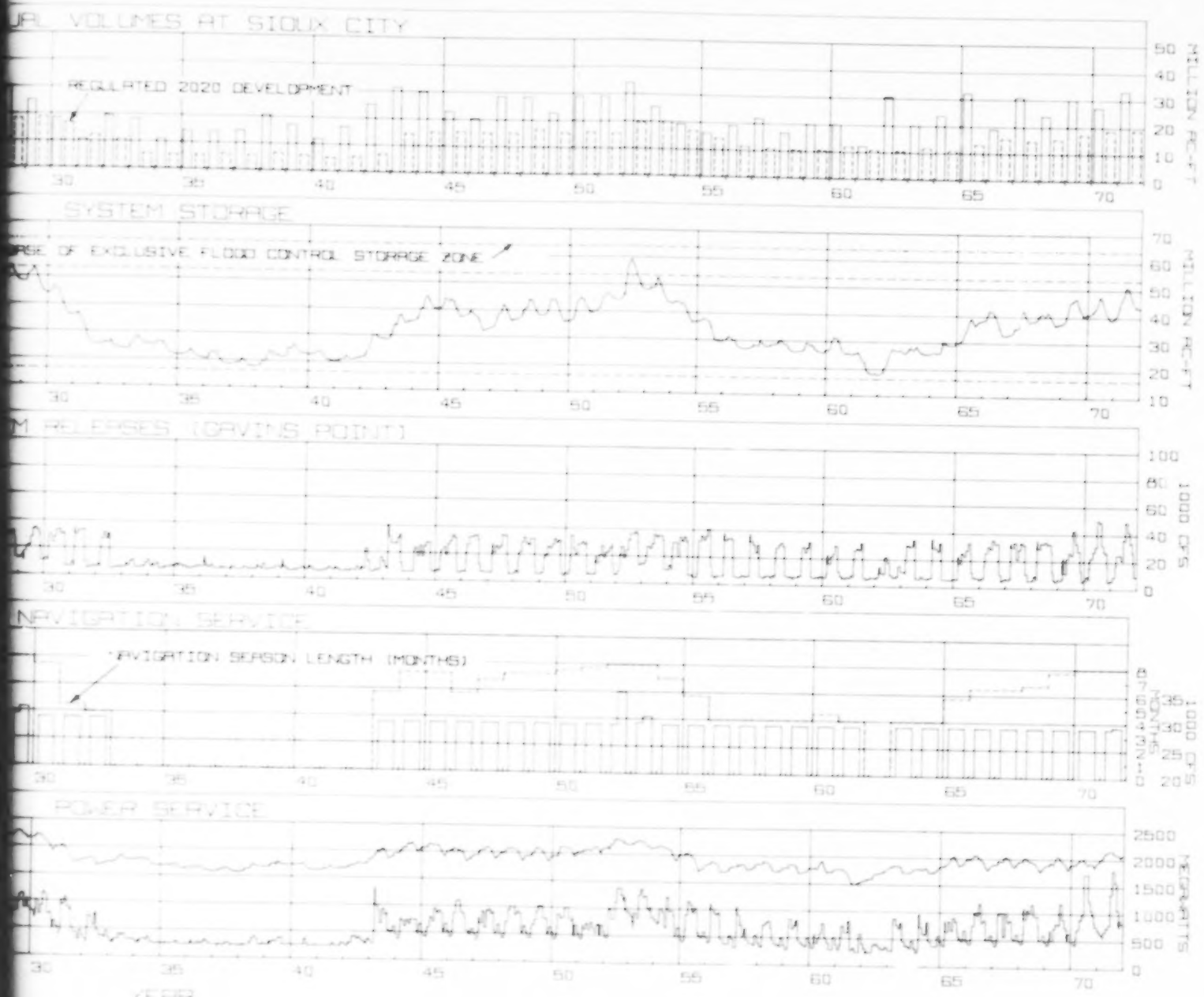


ERVOIR OPERATIONS, STUDY 1-74-2020, D 1400

PLATE 28

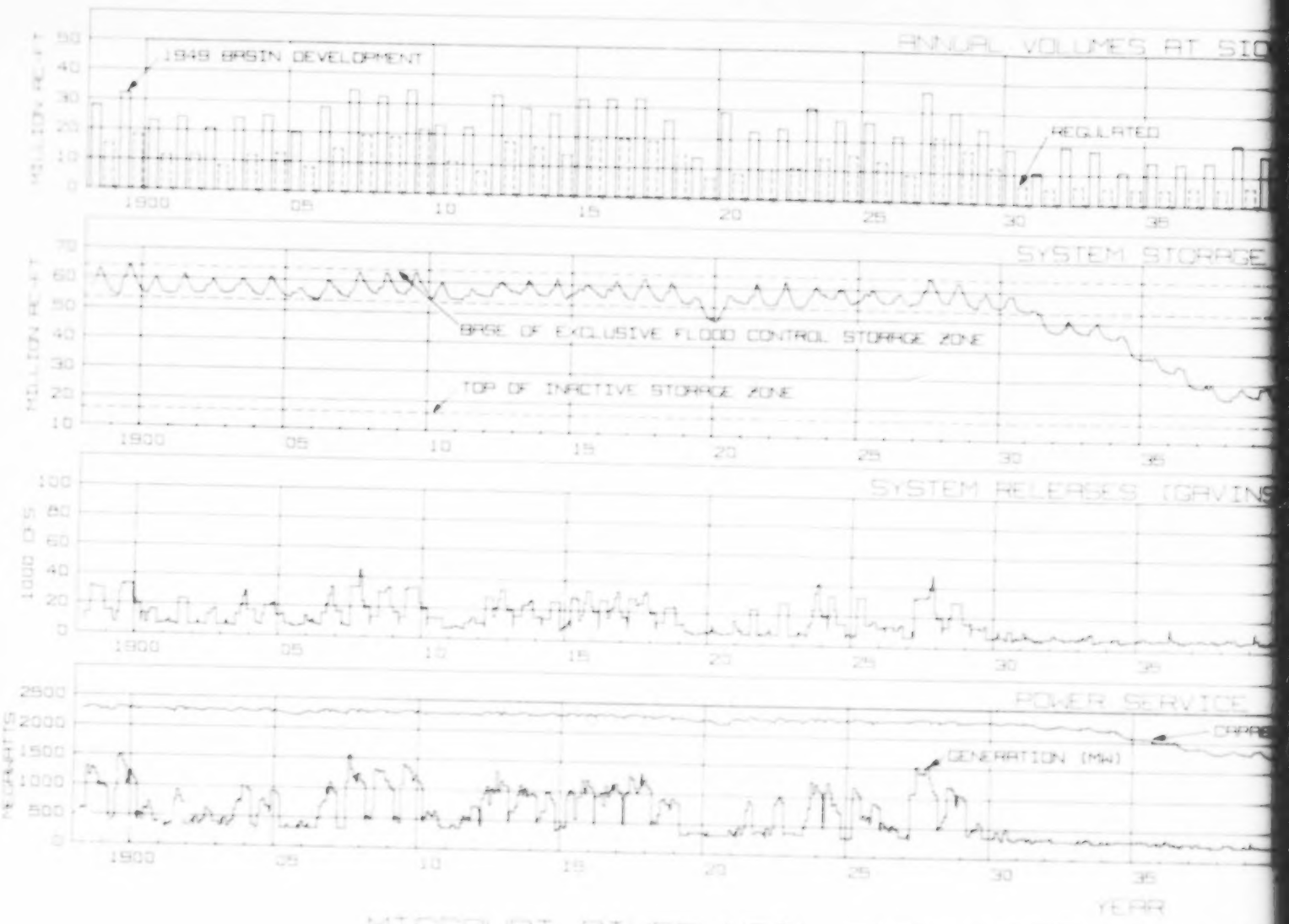


MISSOURI RIVER MAIN STEM RESERVOIR OPERATIO

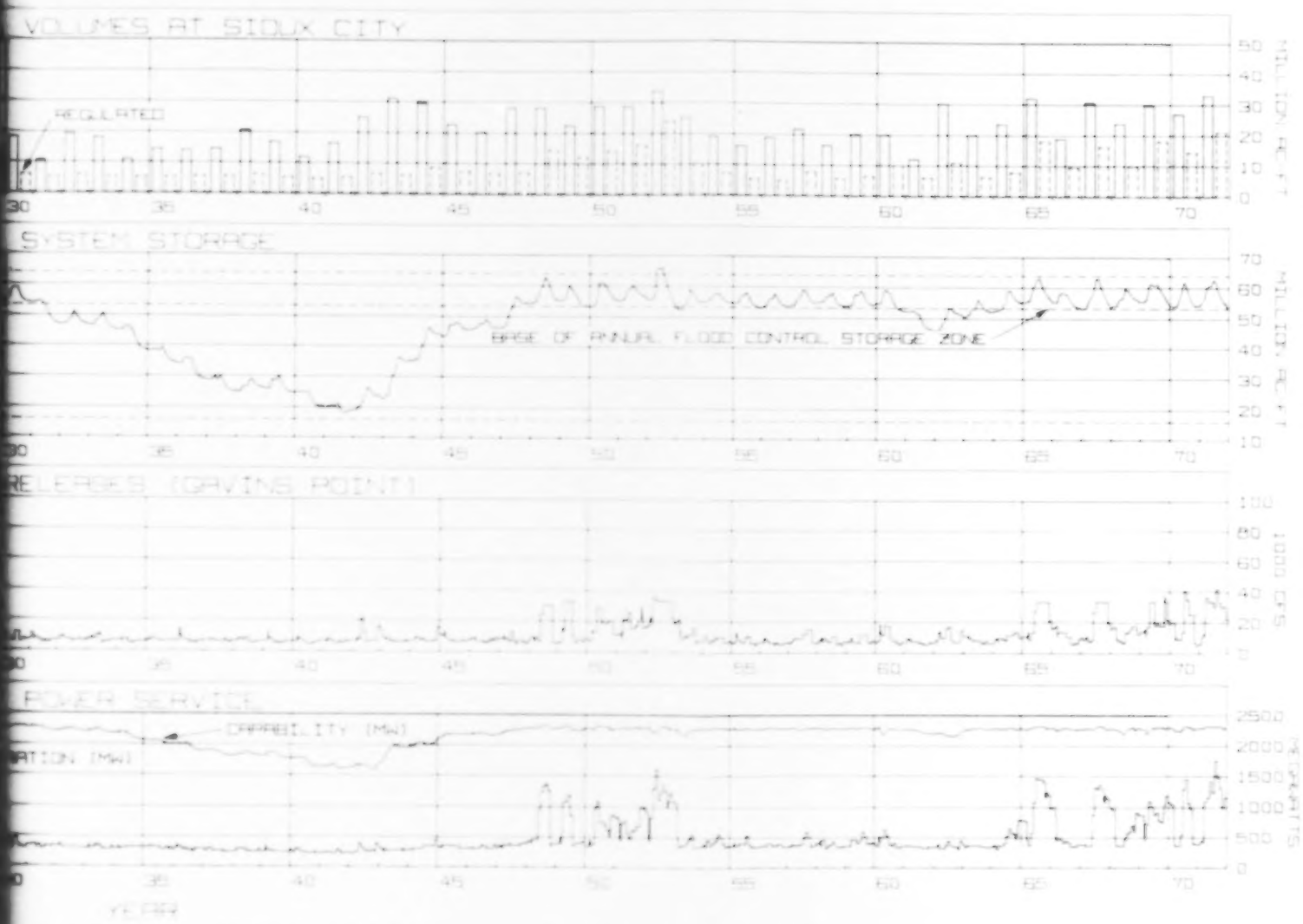


ERVOIR OPERATIONS, STUDY 1-74-2020, D 300J

PLATE 29



MISSOURI RIVER MAIN STEM RESERVOIR OPE



RESERVOIR OPERATIONS, STUDY 1 74-YEAR-LOT